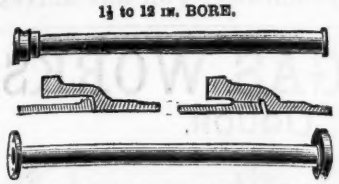
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1478.] LONDON, SEPTEMBER 8, 1891. [43RD YEAR. Price 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
23, GREAT GEORGE ST., WESTMINSTER, S.W.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

PURIMACHOS GAS CEMENT

Capable of withstanding Greater Heat than that adequate to the Fusion of Iron.

Supplied to Her Majesty The Queen; to His Royal Highness The Prince of Wales; and to Her Majesty's Government; to Foreign Governments; and to public and private Gas-Works, &c., in GREAT BRITAIN and IRELAND, in ALL THE COLONIES, and in EVERY OTHER PART OF THE WORLD where Gas is used.

PURIMACHOS is regularly and increasingly used in GAS-WORKS at home and abroad, and has received the special commendation of the most distinguished Engineers and Managers, as invaluable for promptly and economically building, glazing, repairing, and consolidating RETORTS and FURNACES (in and out of action), PIPES, and ALL OTHER ERECTIONS (of Clay, Brick, or Iron) where FIRE or HEAT is employed—the action of which it will effectually resist.

The Highest Testimonials and References from Eminent Authorities, at home and abroad, in support of the foregoing statements.

Registered Telegraphic Address: "PURIMACHOS, BRISTOL." | Prices and further particulars on application to THE MANAGER, BRISTOL PURIMACHOS WORKS, REDLAND, BRISTOL.

C. & W. WALKER.

GASHOLDERS; PURIFIERS; PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
SULPHATE & SULPHUR PLANT;
RETORT MOUTHPIECES; CONDENSERS;
LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;
SLIDE VALVES; TAR BURNERS; &C., &C.
WOOD SIEVES.

ADDRESSES: 8, Finsbury Circus, London, E.C.; Midland Iron-Works, Donnington, near Newport, Shropshire.

"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

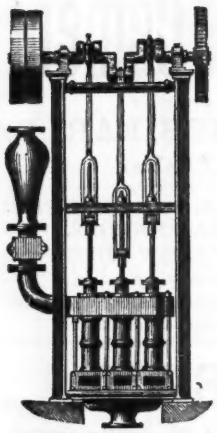
AND

IMPROVED DRY GAS-METERS;

Also Sole Makers of THORP AND MARSH'S PATENT CASH PREPAYMENT ATTACHMENT FOR GAS-METERS.

STEAM & HAND PUMPS FOR GAS-WORKS,

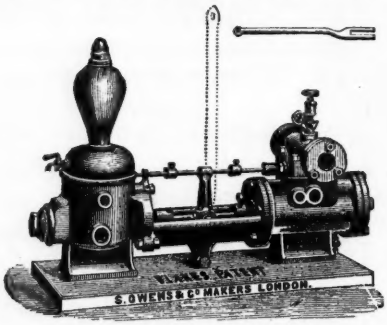
FOR PUMPING TAR, WATER, AND LIQUOR.



Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S

PATENT

STEAM PUMPS.

20,000 IN USE.

Improved Double Action Pump.

Cast-Iron Hand-Pump.

Wrought-Iron Portable Pump.

S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

SOLE MANUFACTURERS OF

MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

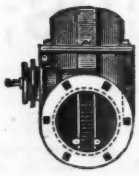
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.

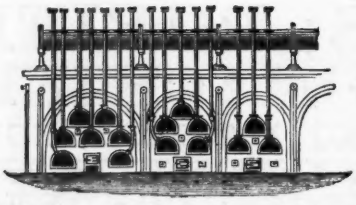
GASHOLDERS,
AND
Gasholder Tanks.

CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.



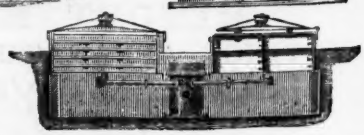


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."

MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

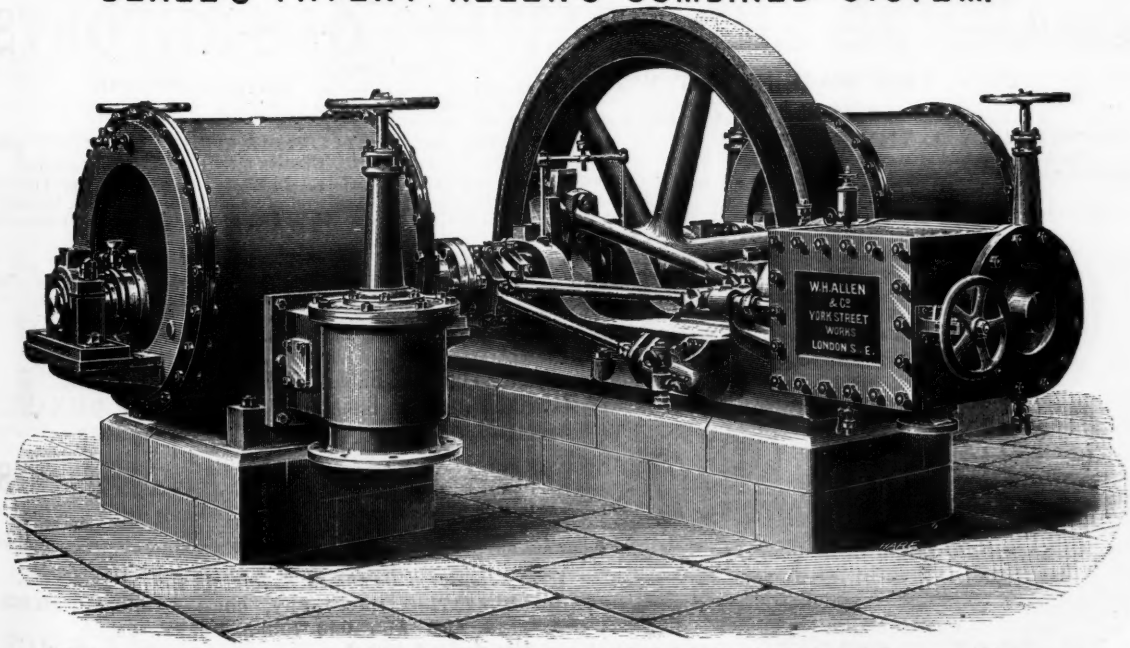
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

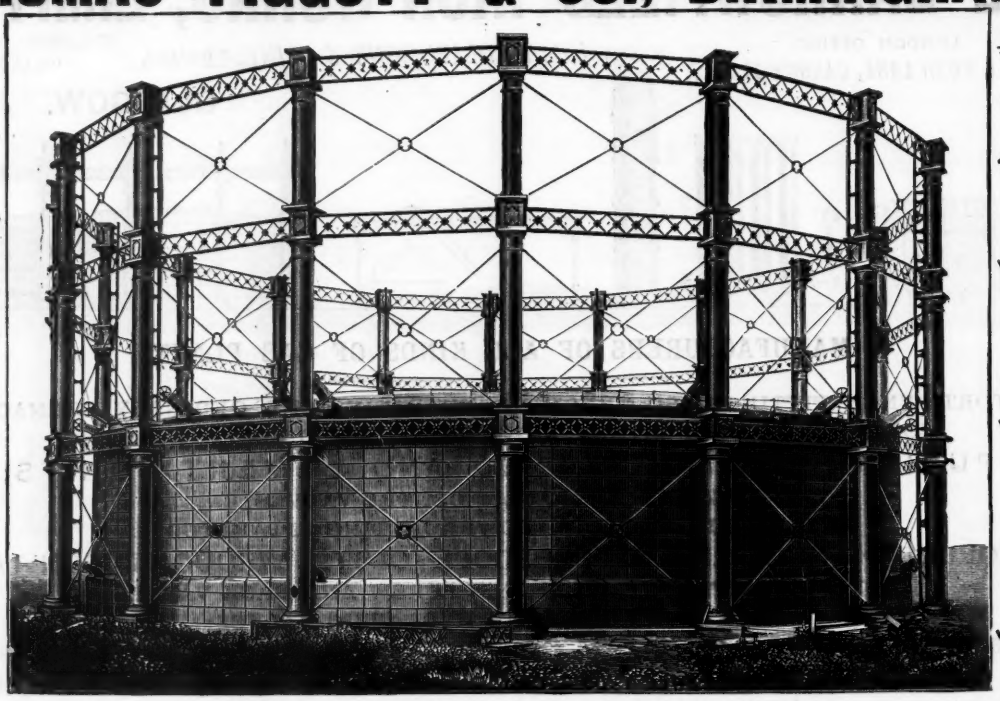


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

WEST'S GAS IMPROVEMENT Co., Ltd.,

Engineers, Ironfounders, & Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

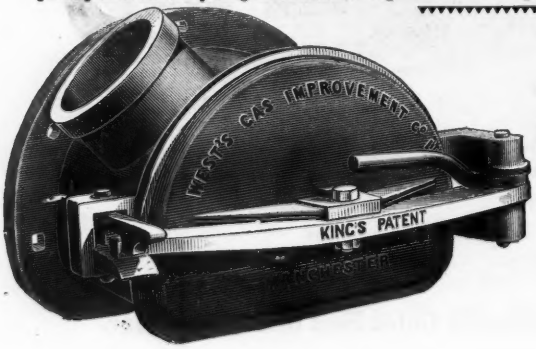
Advantages attending its use are:

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by COMPRESSED AIR, STEAM, or ROPE. The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



MAKERS OF COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY, COKE BREAKING AND WASHING MACHINERY.

Sole Makers of CIRCULAR, OVAL, or Ω-shaped MOUTHPIECES with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

secure a very tight joint; and at the same time the eccentric motion given to the Lid effectually removes the Tar from the surfaces of the Joint.

N.B.—The whole of these Fittings are made of Wrought Iron. Several Thousands in use.

West's Improved Combined Regulating Liquor Seal Valve.

OXIDE ELEVATING MACHINERY, COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT, &c.

Illustrated Catalogue sent upon application.

Mr. JOHN WEST, M. Inst. C.E., *Managing Director.*

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET.
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY OF GASHOLDERS

AND MAKERS OF

REG^D. TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

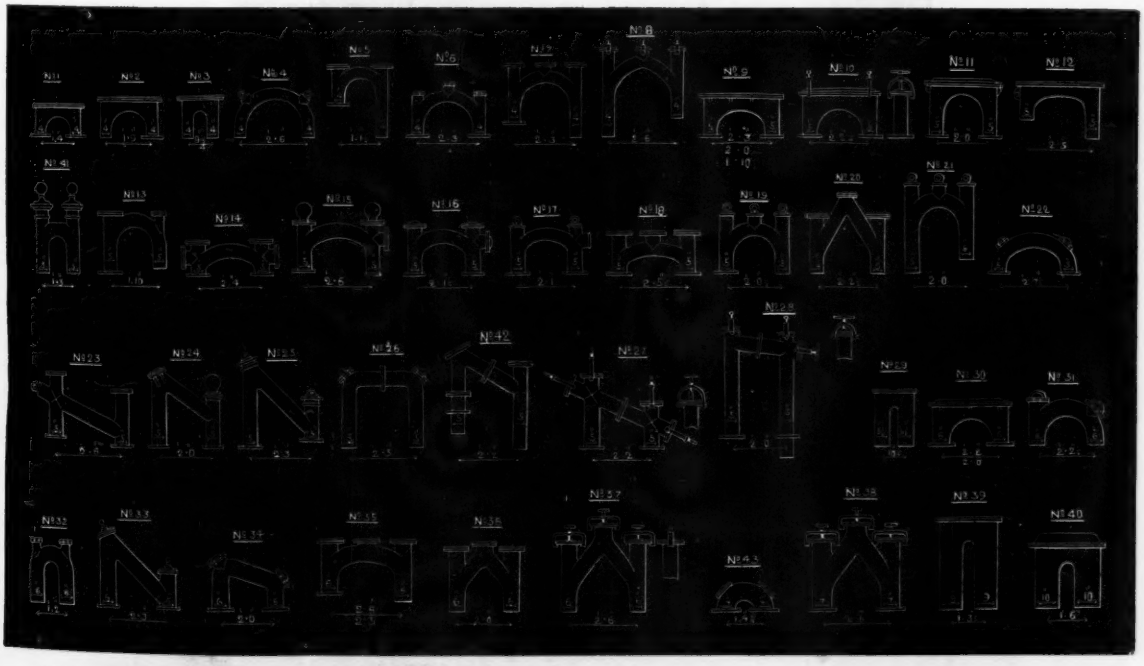
GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL,
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

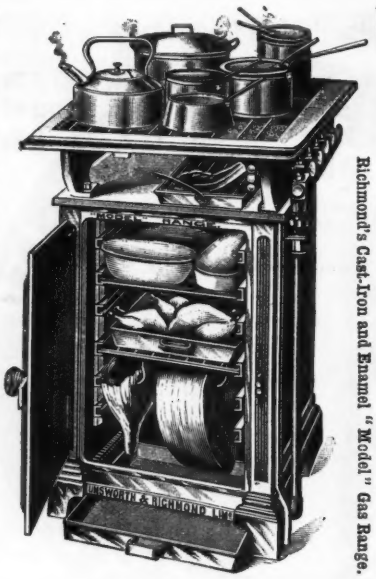


ARCH, BRIDGE, OR H PIPES.

Any of the above patterns can be made with either flange or spigot ends and with faced flanges or turned and bored plugs if required.
Designs Nos. 26, 27, 28, and 42 can be altered to any desired span without extra charge. Other variations by arrangement.

Patterns for special designs or spans made to order.

The best Stove made for Hiring'out purposes. Can be taken to pieces readily.



Richmond's Cast-Iron and Enamel "Model" Gas Range.

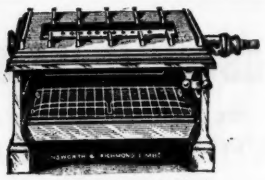
UNSWORTH & RICHMOND, LTD.,

GAS APPARATUS MANUFACTURERS,

WARRINGTON.

GREAT SUCCESS of RICHMOND'S MODEL GAS RANGE. Beat Six well-known Makers.

Nelson, June 2, 1891.



Quick Lever Grill.
No. 200 10×9×7½, 7/-. No. 205 12½×11×8, 10/-.

Burners suitable for heavy work.
No. 300 12ft., 2/6. No. 302 16ft., 3/6. No. 304 20ft., 4/6.

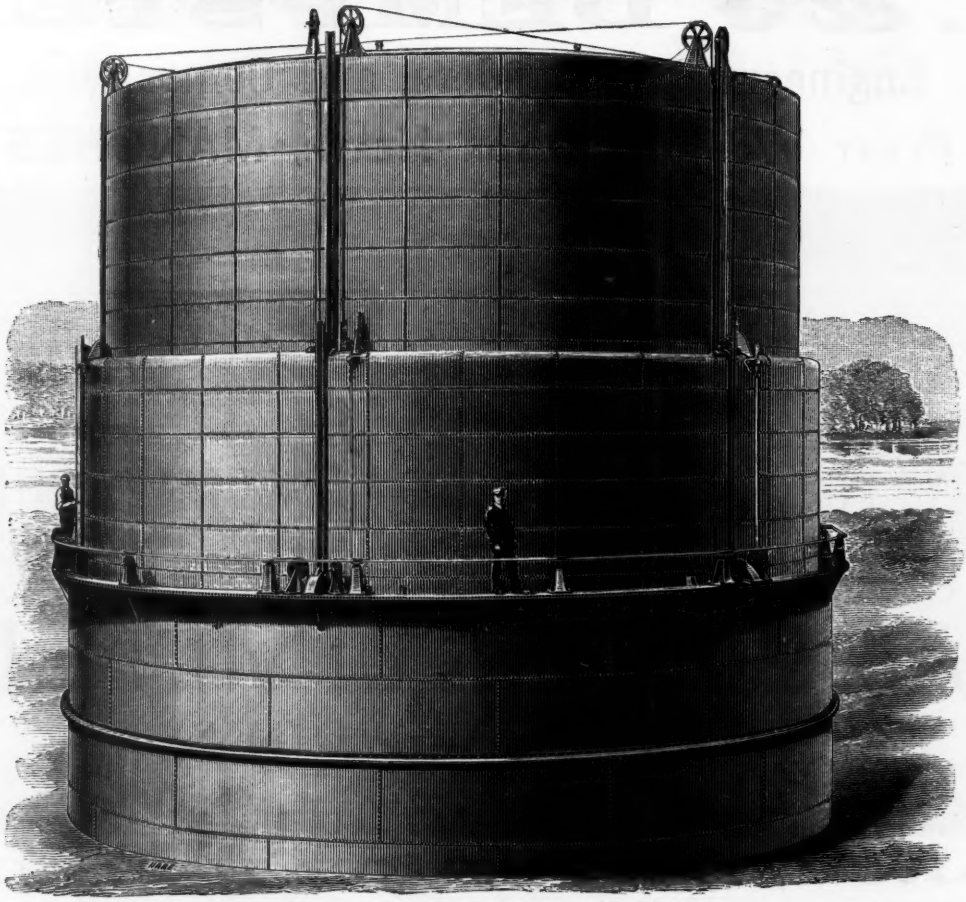
As Block.
No. 306, 1/8.
No. 308, 2/6.

Plain Reeded Rim.
No. 313, 1/6.
No. 314, 2/6.
No. 315, 3/6.

Hot Plate Burners, all loose for cleaning. Jet and Cock combined. Best Stove Extant. Repeat Orders Daily. Try it!

ASHMORE, BENSON, PEASE, & CO., LTD.,

STOCKTON-ON-TEES.



TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

TANGYES'
"SPECIAL" STEAM-PUMP

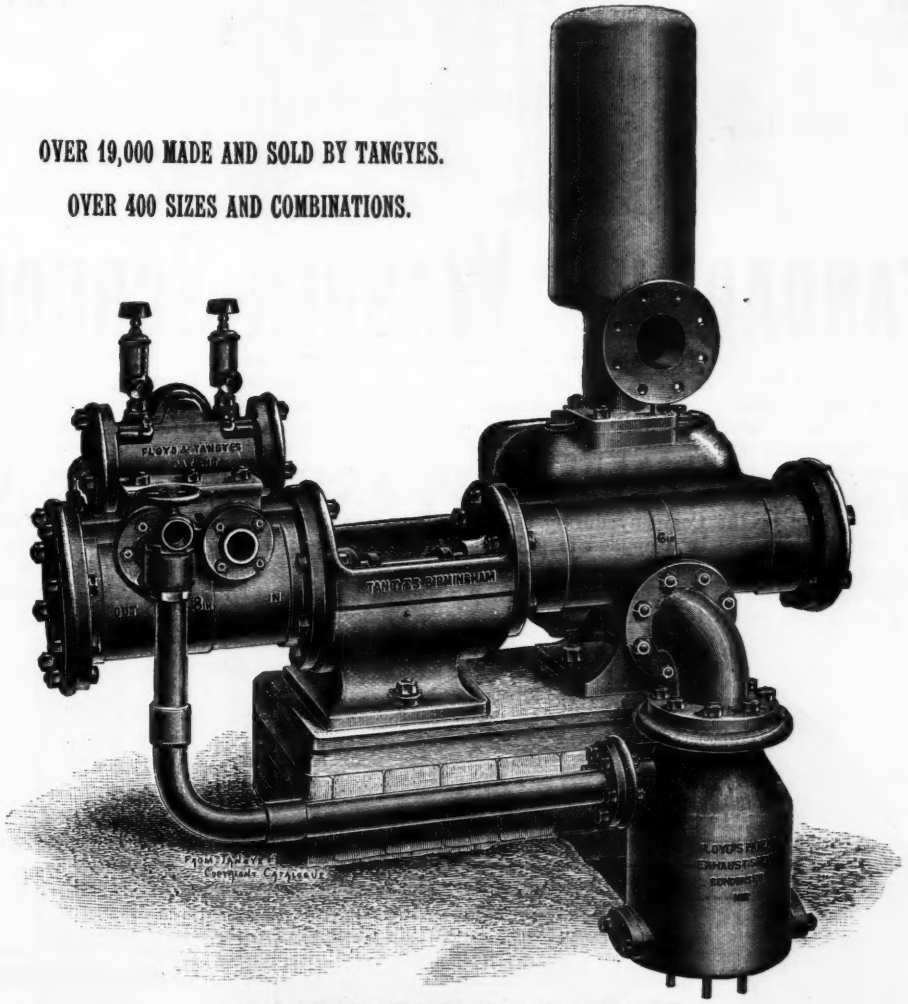
(TANGYES' & FLOYD'S PATENTS),

WITH FLOYD'S PATENT EXHAUST STEAM CONDENSER.

This Condenser is a useful adjunct to the "Special" Steam-Pump when used in mine workings or other confined positions where it is difficult to convey away the exhaust steam. The latter is carried into the condenser, and there condensed by the water which is being drawn into the pump.

OVER 19,000 MADE AND SOLD BY TANGYES.

OVER 400 SIZES AND COMBINATIONS.



FROM A PHOTOGRAPH OF THE 8in. by 6in. by 12in. SIZE.

APPLY FOR SYNOPSIS OF "SPECIAL" PUMPS.

QUOTATIONS ON RECEIPT OF NECESSARY PARTICULARS.

TANGYES LIMITED,

CORNWALL WORKS,

BIRMINGHAM.

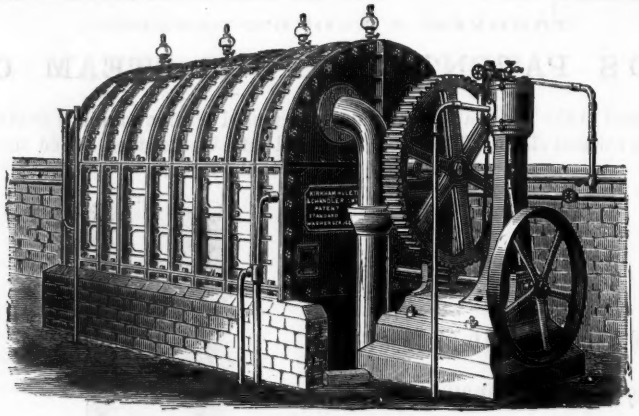
AND AT LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, GENOA, AND BILBAO.

Telegrams: "TANGYES, BIRMINGHAM."

Copyright—Entered at Stationers' Hall. No. 73 E.

KIRKHAM, HULETT, & CHANDLER'S

[SIDNEY HERSEY, Managing Director.] (LIMITED) [J. CHANDLER, Engineer.]



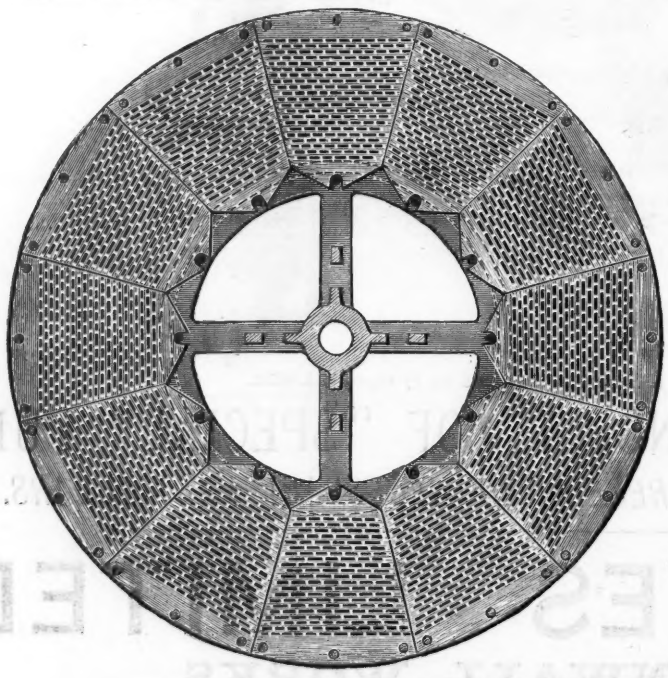
NEW PATENT

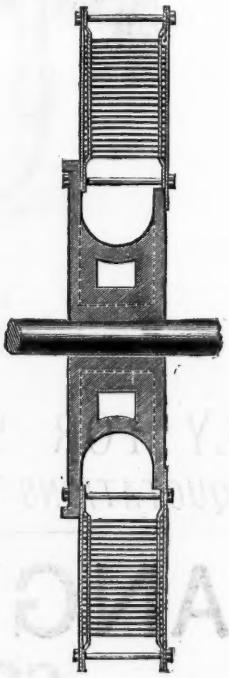
"STANDARD" WASHER-SCRUBBER.

KIRKHAM, HULETT, & CHANDLER, Limited, have pleasure in drawing the attention of Gas Engineers and others interested in the question of the extraction of ammonia and other impurities from Coal Gas to their new Patent "Standard" Washer-Scrubbers, of which 44 are at work and in course of construction.

The original "Standard" Washer-Scrubber (of which 368, equal to a daily capacity of 318,560,000 cubic feet of gas, have been supplied) was admittedly the best machine in the market for the purpose for which it was designed; and the experience gained by the Company during the past nine years has resulted in the production of an improvement on the original patent which has been applied to **23** old pattern machines, and may be briefly described as follows:—

In place of the indented iron sheets made up in segments, and technically called "Bundles," the washing surfaces are now constructed of wooden laths kept in position by being passed through slotted iron sheets, and then butting on to plain sheets, bolted together as shown.





THE ADVANTAGES OF THIS SYSTEM ARE:

(1) The Driving-Shaft of the Washer-Scrubber is relieved of five-sixths of the weight (the weight of the Wooden bundles being only one-sixth of those in Iron).
(2) The weight in motion is only one-sixth of that in the original "Standard" Washer-Scubbers.
(3) The driving power required, and "wear and tear" are enormously reduced.
(4) The washing surfaces keep perfectly clean and free from deposit from end to end of the machine.

ADDRESS: 3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

"KING'S TREATISE"

Says of the ordinary Wet Meter, that—

"If . . . . the level of the water is below its proper position, the wheel is increased in capacity, the Meter indicates less than the quantity passed, and is said to be 'slow.'"

And of the Warner & Cowan Meter, it remarks that—

"By the recent improvement in Meters, patented by Messrs. WARNER & COWAN, the wheel is so constructed as, within a certain range, to register practically the same, under all the various positions of the water-line."—Vol. II., page 33.

Again, before describing the Warner & Cowan Meter and after having noticed previous inventions, the same authority states that—

"It must be admitted that, notwithstanding all that had been accomplished up to this point to insure accuracy in the measurement of gas, and ingenious as are many of the appliances for this purpose, there was a want of directness of aim on the part of the authors. There can be no question, also, that although the advantages which were undoubtedly secured were only secondary in character, the difficulties encountered—and, to the extent indicated, successfully overcome by the inventors—were more formidable than any that presented themselves in the initiation and perfecting of the remarkable invention now about to be described. This, indeed, is merely characteristic of the most striking mechanical inventions of modern times. Their usefulness and value are only equalled by their simplicity and beauty. The 'Warner & Cowan Meter' must be classed amongst the latter."

"Prior to the invention of the Warner and Cowan drum, all improvements in the measuring mechanism of the Gas-Meter had for their object the maintaining of the true water-line. . . . . The paramount excellence of the Warner and Cowan wheel consists in its being perfectly independent of any particular water-line, its registration being correct under all possible variations of level short of the limits of surcharge on the one hand and exhaustion on the other."—Vol. III., page 22.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W. TELEPHONE No. 3250. "DISC LONDON."

DUTTON STREET, WORKS, MANCHESTER. TELEPHONE No. 1345.

BUCCLEUCH STREET WORKS, EDINBURGH. TELEPHONE No. 733. "DISC EDINBURGH."

TELEGRAPHIC ADDRESSES: "DISC MANCHESTER."

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

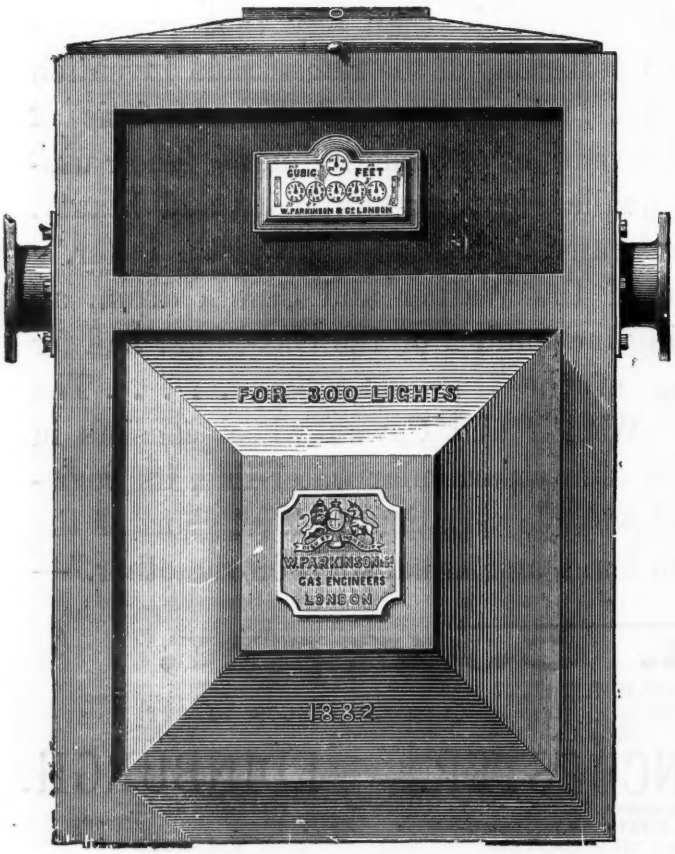
And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The DIAPHRAGMS are of the Finest PERSIAN SHEEP SKINS.

The CASES are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS,

PRESSURE & EXHAUST REGISTERS

MOTIVE POWER METERS,

Test Gasholders, Experimental Apparatus, &c.,

PRESSURE GAUGES OF EVERY DESCRIPTION.

NEW ILLUSTRATED CATALOGUE & PRICE LIST

Sent post free on application.

COTTAGE LANE WORKS, CITY ROAD,

LONDON.

Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION,"

[See also Advt., p. 468.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Meeting of the Trade Union Congress . . . 435
Mr. J. Hepworth on Gas Supply by Municipalities . . . 436
A Compliment to Gas . . . 436
The Chicago Gas Engineers' Club . . . 437

WATER AND SANITARY AFFAIRS—

Mr. Sidney Webb on the London Water Undertakings . . . 437

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 438
Electric Lighting Memoranda . . . 438
Mr. Forster Brown upon Our Coal Resources . . . 439
Gas Lamps . . . 440

NOTES:—

A New Reagent for Oxygen Determinations . . . 441
The Mechanical Equivalent of Heat . . . 441
Naphthalene Deposits on the Inlet Pipes of Gasholders . . . 441

TECHNICAL RECORD:—

Gas Supply in the Hands of Local Authorities . . . 442
Manchester District Institution of Gas Engineers . . . 443
Belgian Association of Gas Managers—The Testing of Coal . . . 444
The Reception and Storeage of Refined Petroleum in Bulk . . . 445

REGISTER OF PATENTS:—

Prepayment Gas-Meters—Cowan, W. . . . 445
Gas Heating and Cooking Apparatus—Greenwood, E. P. . . . 446
Automatic Gas Supplying Apparatus—Hawkyard, J., and Braddock, J. . . . 446
Duplex Burners and Fittings—Love, J. . . . 447
Gas Heating Apparatus—Shaw, G. A. . . . 447
Water-Tight and Fire-Proof Pipes, Roofings, Walls, and Linings—Kraus, P. . . . 447
Gas Lamps—Brown, A. O. . . . 447
Governors and Valve Movement for Gas-Engines—Bosshardt, F. (Huntington, F. A.) . . . 447
Gas-Burners—Attewell, J., Clayton, H., and Selby, E. . . . 447
Patent Notices . . . 448

CORRESPONDENCE:—

The Use of Tar and Ammoniacal Liquor as Manure . . . 448

LEGAL INTELLIGENCE:—

West Ham Police Court—A Claim for Unpaid Water-Rate: A Question of Empty Houses . . . 448

MISCELLANEOUS:—

The Gas and Water Orders of the Past Session . . . 449
Nottingham Corporation Gas and Water Supply—The Annual Reports . . . 449
Crystal Palace District Gas Company—The Half-Yearly Report and Accounts . . . 450
Meeting of the Tottenham and Edmonton Gas Company . . . 450
Meeting of the Bristol Gas Company . . . 451
Provincial Gas and Water Companies . . . 451
Belfast Corporation Gas Supply—Annual Report; The Proposed Extension of the Gas-Works . . . 452
The Board of Trade and Electrical Standards . . . 453
Ventilating and Heating by Mechanical Means—Paper by Mr. W. Key . . . 453
The Gas-Stove Trade . . . 455
Metropolis Water Supply—Mr. Webster's Scheme for a Supply of Spring Water . . . 455
Lancaster Corporation Water Supply—Annual Report . . . 456
Notes from Scotland . . . 456
Current Sales of Gas Products . . . 457
The Lancashire and Northern Coal Trades . . . 457
Gas and Water Companies' Stock and Share List . . . 458

PARAGRAPHS.—Mr. F. Turner, 438—The Late Mr. Alderman Lamb, 438—Eastern Counties Gas Managers' Association, 439—Mr. Corbet Woodall, M. Inst. C. E., 440—The Forthcoming Electrical Exhibition at the Crystal Palace, 440—The Odour of Acetylene, 441—Resignation of Mr. P. H. Wilkinson, of Harrogate, 441—Steel Water-Mains, 443—Underground Waters, 444—A New Departure in Boiler Construction, 444—Reduction in the Price of Gas at Heckmondwike, 448—Mr. Pete Curran on the Manchester Gas Strike, 448—The Salford Gas Frauds, 448—Sale of Shares and Annuities, 449—Extension of the Brussels Gas-Works, 451—Wigan Corporation Gas-Works, 453—A Magistrate "Promoted" to a Nuisance Inspectorship, 457—The Gas Supply of Teignmouth, 457—Proposed Improvements at the Maryport Gas-Works, 458—The Abandonment of Electric Lighting at Barnet, 458—Serious Gas Explosion at Goole, 458—The Gas Question in the Salford Out-Districts, 458—Electric Lighting for Manchester, 458—Australian Gaslight Company, 458—The Water Question at Gloucester, 458—The Salford Corporation Gas Committee and Inclined Retorts, 458.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 8, 1891.

The Meeting of the Trade Union Congress.

THE Trade Union Congress, which is called in some quarters by the rather grandiloquent title of the Parliament of Labour, opened at Newcastle-on-Tyne yesterday; and, if the precedent set during previous assemblies of the delegates has been duly followed, the meetings have by this time developed their maximum degree of "liveliness," which carping critics call by a less complimentary name. It may be remembered how John Burns and the Socialist party—otherwise known as the New Unionists—captured last year's congress; and we have already noted how the same men are preparing for a similar onslaught this year. Tom Mann's journal has laid out a programme for the congress which would occupy its time to the exclusion of all other work; but it is not likely that the representatives of the older Unionism, who have at least had the best experience in the conduct of similar organizations, will permit their practical minds to be turned wholly aside from business in order that the Socialists may vapour away at will about State Arbitration Boards, Municipal Workshops, and the other importations from Germany that go to make up the London agitator's stock-in-trade. It is impossible to deny the significance of these annual congresses; and if their proceedings were more strictly regulated with reference to the real standing of the organizations represented, and to patent truths respecting the relations existing between the labouring classes of the country and its industries, they might be vastly more productive of good than is actually the case. In the measure in which these meetings are made subservient to the personal ends of professional agitators, their efficacy suffers. Whatever may be said to the contrary by those notorious individuals who live by mass meetings, employers of labour in this and other countries are not, and cannot be, enemies of the so-called working classes. They have, of course, their own views as to the relationship that exists between the wage-payer and the wage-earner; and it is quite likely that these views may not correspond at all points with those entertained with respect to the same connection by wage-earners. It is impossible to formulate all the differences of this kind that become manifest from time to time; but it is the principle upon which the trade and industry of the world has been created and developed, that the relations between employer and employed, such as they are, are fundamentally right and natural. This is the assumption upon which civilized industries depend. Trade and manufacture being in a perpetual state of ebb and flow, it would be an impossibility for the conditions of employment to be anything but fluctuating. Nobody can say precisely how or why any particular change of detail becomes necessary; but the change is made, after both sides to the question have agreed upon it. These adjustments of detail are often preceded by a period of more or less acute discomfort among the affected members of the industrial body; but hitherto the latter have been of the nature of "growing pains." The workman's recompense and the workman's treatment as a member of the community have continuously improved. Witnesses as impartial as the late Mr. Charles Bradlaugh have perceived this, and have accepted the fact as evidence that the conditions of the working world are properly based. The older Trades Unions never raised the question of the basis of industrial relations. They aimed at obtaining, by combination, improvements in matters of detail, such as the standard hours of work and scales of wages for different trades, which individual workers could not have procured so easily, so safely, or so quickly. But they recognized the employer as constituting an essential element in the organization of an industry.

The New Unionism, which is merely Socialism dressed in a workman's coat, proceeds upon a radically different assumption. It declares that the existing basis of industry, already mentioned, is all wrong; and it aims at upsetting everything from the very bottom, with a view to re-settling every trade and manufacture upon a totally untried basis (if such it may be called), which nobody can define, but which seems to be a monstrous product of a conjunction of the old French idea of the Rights of Man with modern German Mysticism. It may well be asked how the two kinds of Trades Unionism, thus differentiated from the very root, can work together to any useful end. The Administration of the congress are compelled to plough with an ox yoked with an ass; and what sort of furrows can they expect to turn with such a team? Look to the record of the last congress for the answer. The meeting, under socialistic guidance, passed scores of resolutions referring to all sorts of subjects, not one in a hundred of which came to anything. The Parliamentary Committee alone had thrust upon it something like a hundred instructions to prepare Bills of all sorts, to amend Acts already in existence, and to take steps for the better enforcement of others. What have the Committee done? Simply nothing; and this year they will have a new load of business added to their arrears, which will be treated in the same way.

The Trade Union Congress was preceded at Newcastle-on-Tyne by the annual meeting of the Association of Coal Mining Managers, at which the President, in the course of his address, made a declaration which, although it would once have been regarded as a superfluous expression

of a trite truth, is now to be esteemed as throwing down the gauntlet to the new labour agitators. He merely observed that, whatever might happen, colliery managers must retain control of their own business. In the eyes of the Socialist Trade Unionist, such a proposition as this is monstrous. It is against the application of this very principle in gas-works that the Gas Workers' Union has taken up arms; and it is as if to emphasize this view of the rights of the matter that Pete Curran, the so-called "Plymouth "Intimidator," has been appointed paid organizer for the Union. By the way, it is worthy of notice that Irishmen are getting a good deal of power in this organization, perhaps by virtue of that "genius for politics" which the men of this nation claim as one of their birthrights. Much good may it do them! We have no sort of objection to the appointment of such men as Curran to paid offices in the Gas Workers' Union. At the same time, it is worth while to notice into what hands the control of British gas making is drifting, in places where the Union reigns supreme, in order that it may be understood to whom the credit is due for that increase of efficiency in gas production which it is notoriously the principal object of the Gas Workers' Union to ensure. The very worst that can be said by a Unionist orator of the "blacklegs"—that is, of the three-fourths, or thereabouts, of the men employed in British gas-works, who do not belong to the Union—is that they are inferior carbonizers. Rumour has it that the carbonizing in the largest Society stations has not been at all up to the mark of late. Perhaps, now that the head-quarters' staff of the Union has received an accession of strength, matters will mend in this respect.

Mr. J. Hepworth on Gas Supply by Municipalities.

A FEW weeks since we mentioned the fact that Mr. J. Hepworth, of Carlisle, had read a paper, on "The Muni- "cipal Ownership of Gas Undertakings," at the first conference of the new Association of Local Boards. We are now enabled, by the courtesy of the author, to publish the full text of the paper, which will accordingly be found in another column. Coming so soon as this conference did after the Carlisle meeting of The Gas Institute, it might naturally be supposed that Mr. Hepworth would have found it convenient to give the municipal people a *réchauffé* of some portions of his presidential address to the Institute. It is not to be denied that there is more than one echo of the address in the paper. But this is pardonable, and indeed almost inevitable; for it is generally found that when a man has had a certain range of subjects prominently in mind for some time, his studies impart their colour to most of his subsequent talk. Taking these two occasions together, we may truthfully say that Mr. Hepworth's paper is supplementary to his address. He spoke to his brother gas managers largely in the capacity of a municipal officer; and it is no wonder that he should soon afterwards have spoken to municipal officers largely in the capacity of a gas manager. Mr. Hepworth is a very diplomatic gentleman; and he said nothing to the Local Boards that his gas engineering friends can adversely criticize. This is no mean feat of dialectics, when it is remembered that, while maintaining the thesis that "the benefits which have accrued to local authorities "from the possession of gas undertakings have been greater "than is generally recognized," he adheres firmly to the view that "all local authorities should follow the prac- "tice compulsory upon the local authorities in Scotland, "and sell gas at cost price, certainly within their own dis- "trict, and especially when cost price does, and in every "case must, include the amount necessary to extinguish "the capital of the undertaking within the prescribed "number of years." Mr. Hepworth agrees with Mr. Newbigging as to the propriety of charging differential prices as between home and outlying districts; and he holds that where the difference is reasonable, even if it allows a margin of profit, the outlying district has no just cause to complain. This is all very well, so far as it goes. We may be disposed to agree with Mr. Hepworth, when he says that "a legitimate profit is not only "reasonable, but in the case of a local authority will "probably be less than would have been paid if a com- "pany had supplied the gas; and if the profits are being "contributed by one district to an adjoining district, the "hardship, if it be one, is no greater than would exist if "the profits had been contributed to a gas company, "whose shareholders might by chance reside in every "district in the United Kingdom." We apply to this argument the same comment that we used last week with reference to Mr. Newbigging's paper. We want to see an "A and B case" properly stated before we can pretend to understand what is meant by the term "reasonable" in connection with a matter of this nature. Circumstances alter cases so strongly that generalities do not much avail in the discussion of this question. It is a plausible way of stating the general problem, to say that when an outlying district asks for a supply of gas from a neighbouring centre of population, it should not grumble at being charged a little more than the centre for which the works are intended, especially if the difference is less than would be the case if the supply were to be drawn from an independent source. When, however, two parties to a bargain begin to talk about what is to be understood as a "reasonable" extra, differences of opinion are apt to arise. The central gas-works owning authority cannot always be depended upon to fix an extra rate for an outlying district with sole regard to strict justice. Instances are on record—as admitted by Mr. Newbigging—of a local authority proposing to locate a gas-manufacturing station in an outlying district, while yet charging consumers in that district at a higher rate than that levied in the centre. Generally, however, it is the gas-supplying authorities who subsidize local rates out of their surplus profits that get into the hottest water with their outlying consumers. The rallying cry in these cases is simply, "Why should we help to pay your rates?" And this is a query that will take a good deal of answering before the querists are satisfied. For the rest, we congratulate Mr. Hepworth upon his manful adherence to his policy of counselling local authorities owning gas-works to put such property under proper management; and we only wish that every Municipality was so rightly guided in this regard as Carlisle.

A Compliment to Gas.

ONE of the greatest compliments that gas lighting has ever received comes, oddly enough, in the past week's news from Constantinople. According to the reports that appeared in the daily newspapers on Saturday, a change of the Ministry at the Sublime Porte was brought about by the simultaneous occurrence of two such portentous events as an accidental extinction of the gas in the palace of the Sultan, and an explosion of fireworks in the street. His Majesty, who seems to be suffering from chronic disturbance of the nerves, promptly acted in the matter, as the newspapers put it, by "dismissing the Grand Master of "Artillery, whose duties include a superintendence of the "domestic gas supply, for failing to keep up a light, and "arresting the officious pyrotechnist for starting too good "a one." All sorts of political complications are expected to follow from this untoward circumstance. It is the habit of newspaper writers to treat the ministerial arrangements at the Sublime Porte as fit subjects for ridicule. According to these well-instructed organs of public opinion, the Sultan of Turkey habitually acts in matters of government very much after the style of a monarch one meets with in *opéra bouffe*. The incident of the going out of the gas in the palace, and the action taken thereupon by the Sultan, are too good opportunities for political comment of the semi-comic kind for our daily contemporaries to miss, particularly in the dead season of the year, when the world at large obstinately refuses to keep up the usual supply of political "copy" for the newspapers. We, however, take leave to comment upon the Constantinople incident in a different fashion. We can easily conceive that the Sultan was alarmed at the occurrence of such a strange phenomenon as the failure of the gas supply to his place of residence, and think it only natural that his not-too-well-educated Majesty should have regarded the event as portentous, just as his progenitors did eclipses of the sun, the falling of stars, and other disturbances of the order of the Universe. What can be more certain and reliable, in an ordinary way, than gas supply? and what more wonderful than its failure? Now, if the palace in question had been lit by electricity, it may be safely assumed that the Sultan would have been more annoyed than alarmed at an occasional spell of darkness. Instead of dismissing a Grand Master of Artillery for such a trifle, a mild corrective in the form of the bastinado, or its modern equivalent in Turkish seignorial economy, applied to a lower official of the household, would have met the case. When the

gas goes out, however, the Sultan evidently thinks that things look serious; and he acts accordingly. Said we wrongly that this is a high compliment to gas lighting?

A Chicago Gas Engineers' Club.

It is worth noticing that the City of Chicago, which aims at being "Metropolitan" in all things, desires to have a Gas Managers' Society all to itself, just as New York has its Society of Gas Lighting, and Boston its Guild of Gas Managers. Mr. Frederick H. Shelton, the Manager of the Natural Gaslight and Fuel Company of Chicago, is the prime mover in this scheme, which seems likely to take shape in the immediate future, if our contemporary the *American Gaslight Journal* is well informed on the subject. The suggested name of the new Society is stated to be that of "The Associated Chicago Gas Men," which we agree with our contemporary in thinking a very indifferent effort at nomenclature. It is not for us to advise the Chicago gas engineers in such a matter; but surely, it may be hoped, the resources of the American language are not so limited that so poor a title as we have quoted is the best that can be hit upon. This, however, is a small matter. With regard to the possibility of the successful formation of a Society analogous to those of New York and Boston in the City of Chicago, we can have nothing to say. Competition by gas companies has one redeeming feature, and only one that we know of—it ensures a good crop of gas managers, of whom there are not enough in the world. The chief result of the amalgamation of the thirteen London Gas Companies which we have ever had to regard as a debit entry against the system, is the reduction of the number of Metropolitan gas engineers and secretaries holding independent posts. There is little fear, or hope—whichever is the right way of expressing it—of a similar result being produced just yet in the populous places of the United States. The gas managers of New York, Brooklyn, and the parts adjacent, constitute a respectably numerous corps of intelligent and "clubbable" gentlemen, with a sufficiency of common interest to render their intercourse mutually pleasant, and with enough rivalry to lend piquancy to their meetings upon the neutral ground provided by their social organization. What New York and Boston have done in this way, it would be invidious to suppose Chicago incapable of doing also. With regard to the principle of this class of semi-technical, semi-social organizations, we can only say that it strikes us as eminently desirable; and we could wish that London had its Gas Engineers' Club, based as nearly as might be on the New York model. A District Association of Gas Managers is not at all the same thing. It is a formal, not to say a pretentious affair; and the social side of such an Association is ostensibly kept in a secondary place in its scheme of utility. In a Club or Society like that of the New York Gas Managers, the state of things is exactly reversed—it is an informal, social scheme throughout. The members meet for mutual confabulation, without reporters; and the friendly dinner and the sociable talk are more in order than the technical paper or the presidential address. Papers are, it is true, occasionally read at the meetings; but they are not essential to the success of the gatherings, which are the more frequent as nobody is taxed to provide mental pabulum for the rest. The difficulty of exactly balancing the convivial and the professional attractions of District Gas Managers' Association meetings is keenly felt, on occasion, in all parts of the country. Everybody is scandalized when the former prove a better "draw" than the latter; but it is impossible to resist the conclusion that the technical and formal programmes at these meetings are sometimes unnecessarily heavy. This is not a new discovery of ours; for we have expressed the same reflection before. It is not that the work done by our District Associations is not well done, or is not worth doing. The mass of technical literature which their "Transactions" make every year is of the greatest value; and contemporary gas engineering science could ill spare it. Nor could it be produced by any means which did not involve the most particular regard to the injunction that all things should be done "decently and in order." All we are disposed to contend for is that much of the most useful work of a professional Association is of the informal kind; and we confess to rather envying the circumstances that lend themselves, as in the cases under notice, to candid recognition of this truth.

WATER AND SANITARY AFFAIRS.

One Mr. Sidney Webb has written a book, which he has been pleased to entitle "The London Programme." In a series of twenty chapters, we have a sketch of numerous reforms which are said to be demanded in order that the Metropolis may be properly governed and duly provided for. By a process of "municipal self-government," everything connected with London is to be revolutionized, whether it relates to gas, water, markets, the docks, tramways, hospitals, the police, the poor law, the housing of the people, or the basis of taxation. The County Council is no longer to be "in chains;" and "Vestrydom" is to be abolished in favour of "powerful District Councils." Finally, we are presented with a picture of "London as "it might be." It is rather singular that after proposing the exaltation of the County Council to the very pinnacle of municipal power, or something yet higher, and extinguishing the Vestries, the "programme" immediately proceeds to deal with what is called "London's "Water Tribute." Only let the Water Companies be overthrown, and in comes the deluge. The chapter in which this cataclysm is discussed, opens with the statement that London is at present supplied with water from the works of eight Companies of private shareholders, "who profess to have expended a total capital of over "£14,000,000." The shareholders have no need to "profess" anything on this point. Official records guarantee the fact; the latest annual report of the Local Government Board containing a statement by General A. de C. Scott, showing that the "total certified expen- "diture of the Metropolitan Water Companies" at the close of 1889 was £14,630,000. Mr. Webb signifies that the amount is "largely swollen" by "the wasteful extra- "vagance engendered by abundant wealth." This has certainly not been of late years; and in the past the Companies lacked opportunity—their "wealth" being of a problematical character. Shareholders are fond of dividends, and the careful management of the finances has enabled the Companies in recent times to reap a reward which has been long deferred. Mr. Webb considers it "probable" that duplicates of the existing works could be produced for £10,000,000. Supposing they could, such a fact would not necessarily establish a charge of extravagance or mismanagement on the part of the Companies, who have unavoidably built up the present system by degrees, instead of starting with a complete system at once.

"It costs under £700,000 a year to supply London with "water; but London has to pay more than £1,700,000 a "year for the water so supplied." So Mr. Webb puts the case. His figures are rather old; and we presume he is dealing with the statistics of 1887. In that year the water-rates, after deducting empty houses and bad debts, amounted to £1,719,000. It is true that maintenance and management only amounted to £656,000; leaving a profit of more than £1,000,000 on the trading account. But interest on loan capital, together with debenture and preference stock, took £170,000 out of this; and the remainder went in payment of dividends, which in some cases did not exceed 6 or 7 per cent. The capital account is not to be ignored as if the money invested had nothing to do with the revenue. Mr. Webb himself says: "The "surplus serves to pay, on an average, over 7 per cent. "on the nominal capital of the eight Water Companies." Considering the risks that had to be encountered, and the years when dividends were low, we do not see that the shareholder is getting more than he might reasonably hope for. Mr. Webb rather oddly says: "The money question is, however, the smallest part of "the difficulty." We believe, as we stated some time ago, it is by far the greatest part; and if the County Council could only get possession of the water supply on certain terms ruinous to the shareholders, very little more would be said. Mr. Webb asserts that "the present "London Water Supply is neither adequate in amount "nor safe in quality;" and he goes on to say: "Little "more than half the houses in London have a constant "supply." In support of this statement, he again refers to the figures of 1887—showing the proportion of houses on constant supply to be 51 per cent. According to a parenthesis on page 35, the chapter on "London's Water

"Tribute" was written last April. Had Mr. Webb taken the trouble to look at General A. de C. Scott's report for the commencement of the year, he would have found the constant supply extended to 63 per cent. of the houses; and on further inquiry he might have learned that the process was by no means a stationary one, as we have lately shown.

As to the quality of the London Water Supply, we need not take the trouble to contend with Mr. Webb. We may simply refer him to the monthly reports of Dr. Frankland and other eminent authorities. But how does he propose to deal with the entire question? "We must "go to the Companies," he says, "with two simultaneous "Bills, backed by the Ministry of the day." The "we" is the London County Council, endowed, we presume, with enlarged powers. In one Bill there is to be an offer to purchase the plant and mains of the Companies "at a "fair valuation as they now exist, without reference either "to cost or to Stock Exchange share quotations." In the other Bill, "Londoners must hold to the right to seek for "themselves a new supply of the prime necessity of "urban life, and to provide for themselves the most im-"proved methods of filtration and distribution." The oracle further declares that "any repetition of the financial "proposals of 1880" may be trusted to produce to-day "no less a storm" among the six hundred thousand Metropolitan electors, than that which proved fatal to Lord Beaconsfield's Administration. Yet the undertakings are more valuable now than they were eleven years ago. Of course, Mr. Webb falls back on Sir W. Harcourt's dictum, that "the Companies possess no monopoly of "supply." Yet where is the proof that competition is practicable? "Reckless competition between rival "companies," is mentioned by Mr. Webb as one reason why the capital account was swollen in days gone by. Another cause of expense he mentions as consisting of "legal and parliamentary charges." This is virtually the prospect Mr. Webb holds out for the future. A costly struggle is impending, and has already begun. Money is being wasted all round; and should the undertakings pass into the hands of a "Statutory Committee," there will apparently be further waste in the pursuit of a new supply. The close of the chapter to which we have referred is significant. "The municipalization of its water supply "is evidently one of the most pressing items in the "London programme." It is one of the most prominent, and will be used to support the claim of the County Council for enlarged powers, while in the future looms an augmented revenue, brought about by an "unearned "increment" arising out of the expended capital of the Water Companies.

Mr. F. Turner, Manager of the Ringwood Gas Company, will relinquish this position on the 14th inst., in order to take the supervision of the Chard Gas-Works. Mr. Thomas, inspector and fitter to the Poole Gas Company, has been appointed, out of 40 applicants, Mr. Turner's successor at Ringwood.

The Late Mr. Alderman Lamb.—The first business before the Manchester City Council last Wednesday was the election of an Alderman in the place of the late Mr. Alderman Lamb, the Chairman of the Gas Committee; and the honour was conferred upon Mr. B. T. Leech. The Mayor (Mr. Alderman Mark) then referred to the death of Mr. Lamb—speaking of the great estimation in which he was held, and of the valuable services he had rendered to his native city. In concluding his remarks, he asked the members to give expression to their feelings on the sad event by adopting the following resolution: "That this Council desire to record their sense of the great loss sustained by the death of Mr. Alderman Lamb, whose connection with the Corporation dates from 1846, and who had thus for nearly half a century taken an active part in their deliberations and the administrative work of the city. The Council recall that their late colleague was, with one notable exception, the oldest member of the Council; and his removal creates a void which they will long regret. They feel this recognition of his valuable services to be due to the family of their departed friend; and they also desire to recognize his many excellent qualities, courteous manners, pacific disposition, and the high moral influence of his character, as well as the vigour and animation with which to the latest period of his life he was accustomed to address the meetings of the Council upon topics of public interest. The Council desire to convey to Mrs. Lamb and the other members of his family this tribute to the memory of a good and worthy citizen, with expressions of sincere sympathy in their great sorrow and bereavement." In a few appropriate words, Alderman Sir J. Harwood seconded the resolution, which was unanimously agreed to.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 458.)

THE past week has been a decidedly lively one in the Stock Exchange, especially for the holiday season; and markets have experienced a good deal of up-and-down movement. The "boom" in American rails was at its climax on Monday; and the Government Stocks of the southern portion of that hemisphere also rose. A check, however, occurred to the railroad rise the next day; and realization of profits was the rule. Upon the following morning they rebounded, only to fall back again on Thursday; and so they continued to oscillate, more or less, to the close. British rails, however, had more falls than rises; and Home Government securities tended downwards. Other departments were not remarkable. The Money Market showed a disposition to harden early in the week; but nothing came of it. The Bank-rate remained unchanged. Gas has been a quiet market all through the week; and variations of price are few, and for the most part inconsiderable. With one exception, however, they are all in the upward direction. Gaslight "A" opened strong; and the quotation advanced 1 on Monday. But on Wednesday it was put back again to the old figures. It may at the same time be observed that the best price of the week—234—was realized on Saturday, when the stock was nominally quoted at the lower figures. A few bargains were marked in the 10 per cent. preferences and in the "H" limited, at good average prices. Transactions in South Metropolitans were very restricted. The "A" and the debenture stocks fetched better than middle prices; but the "B" went below them. Commercials were not noticed. Suburbans and Provincials have undergone more change. Brentfords, both old and new, are higher; and Brighton has also advanced. But Alliance and Dublin is ½ lower. The Crystal Palace Company's accounts show a very poor result for the half year. It requires about £13,600 to pay their moderate dividend; and the earnings are £10,000 short. But with their gas at half-a-crown per thousand, what can be expected? It would require another sixpence to put them straight. We are no advocates of high prices; but there is such a thing as a *reductio ad absurdum*. The Foreign Companies remain unchanged, except a rise of 2½ in Continental Union. Water has been pretty well stagnant; but prices are looking up, although the only change is a rise of 1 in East London.

The daily operations were: Gas opened firm on Monday, and several improvements took place. Brentford old rose 3; ditto new, 1½; and Gaslight "A" and Brighton, 1 each. Tuesday was without special feature. On Wednesday, the general tone remained good, though Gaslight "A" relapsed. Thursday was quiet, but firm; and Continental Union rose 2½. Gas was busier on Friday, but nothing moved. East London Water rose 1. Issues generally were steady on Saturday, except Alliance and Dublin, which fell ½.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting too Dear for Householders—Mr. W. H. Massey on the Prospects of Electrical Supply Companies—The Aspirations of Electricians—Prospects of Employment for Electricians.

THERE is a marked sympathy between the two most ancient and renowned London papers—*The Times* and *Punch*—so that the latter prefers to take the former as the authority upon which to base its more or less humorous comments upon passing events. It was perhaps for this reason that immediately after *The Times* had published the interesting article and critical notice relating to the electric lighting companies of London (which have been recently referred to in the JOURNAL), *Punch* came out with a Linley Sambourne cartoon representing an imaginary interview between "Paterfamilias and the young Spark"—the latter being a somewhat impish embodiment of the electric light. The picture was accompanied by some lines of rhymed dialogue, turning mainly upon the dearness of electric lighting as the reason why the average London householder is shy of admitting it into his domicile. As usual, the pictorial part of the combination is very superior to the letterpress. "What," says the Electric Light to the Householder, "won't you let me in—a dear little chap like me?" To which the Householder replies, "Ah! you're a little too dear for me—at present." Not very witty dialogue, perhaps; but not devoid of point. The severity of the sketch, however, lies in the character of the house, and the appearance of the occupant who proclaims electric lighting to be too expensive a luxury. It is a very good house, a mansion in fact; and the old gentleman who administers the rebuff to the "tricksy spirit" has the exterior of an individual of very comfortable substance. When this aspect of the artist's work is perceived, the sharpness of his criticism gains immensely. Evidently, Mr. Linley Sambourne does not follow Mr. Preece in regarding electric lighting as suitable for poor men.

The same *Times* articles evoked some instructive epistolary comments from people who may be supposed to know something of the subject. Mr. W. H. Massey hastened to put himself on record, as the Americans say, as agreeing that the Chamberlain Act did more good than harm, in checking wild speculation at a period when the difficulties of town lighting on a large scale had not been realized. Even now, however, there is more room

for speculation than there is for solid business. Mr. Massey observes that it is, in the majority of cases, far easier to raise and spend shareholders' money than to generate, distribute, and sell electric current at a profit. He declares it to be "an open secret that some of the existing companies cannot earn a dividend unless the price per Board of Trade unit is raised." This statement may be true; but if it is, what becomes of the prospect of electric lighting growing in popularity? If it is even now too dear for the well-to-do householder who can afford to live in a town mansion, rented at £200 a year or thereabouts, what class of the community will be able to patronize it when the actual rates are increased by 25 or 30 per cent.?

The electricians are very disappointed with the proceedings of the British Association this year. They were not very well represented among the readers of papers—the only "star performer" in this line whom they could claim as one of themselves being Mr. W. H. Preece. But he forsook electric lighting for the time, and devoted his attention to telephony. There was not, indeed, a single paper read at this meeting upon public lighting; and it is therefore easy to understand how disappointed our friends and rivals are at having thus lost a familiar means of free advertisement. The fact is, of course, that the most pressing problems occupying the attention of the electric lighting interest of this country are of a commercial, rather than a technical or a scientific nature. How to supply current at a reasonable price, and pay a dividend, is a question that can hardly be debated in a Section of the British Association, yet that is the point of absorbing interest for electricians just now. The remarkable experiments of Mr. Nicola Tesla upon lighting by induction have scarcely turned the attention of the electrical world from the established systems, unsatisfactory as these are on the score of expense in working. It is recognized that, although startling effects are producible by induction, or, as it may be termed, by influence, the warning "No thoroughfare" has long been posted at the entrance of the road which Mr. Tesla has taken. More interest of a practical character attends the announcement that an arc lamp of only 150-candle power has been devised, and is shortly to be put upon the market. For ten years the search after a small, manageable, and reliable arc lamp has been prosecuted, without result. Yet it is certain that, if the economy of the arc lamp could only be obtained without involving the present necessity for an excessive concentration of light, a new era would dawn for the electrical supply companies. Whatever may be asserted to the contrary, the field for the convenient employment of "2000-candle power" lamps is very limited. A lamp of (say) 150-candle power is the most powerful centre of light that can be satisfactorily used for ordinary purposes without giving rise to objection on the score of its dazzling effects upon human vision; and whoever can produce an arc lamp of this class will do more to redeem the prospects of the electrical supply companies than appears to be possible in any other way.

Although the original Hammond College for training the sons of gentlemen to be electricians went the way of many other schemes of the "flush times" of electrical speculation, it may be noticed that there yet remains a popular superstition that the profession of electrical engineering promises lucrative employment for well-educated, gentlemanly youths of a mechanical turn. There is every reason to believe that this is a mischievous error, which is kept alive to an extent by premium-robbers, and as such ought to be exposed in the public interest. Considerable comment has been aroused by the offer of the Glasgow Corporation of the small salary of £250 a year for the services of a qualified electrical engineer; and it is no secret that many practical electricians can hardly find employment, while the consulting business is a mere relic of what it was some years ago. An electrical contemporary appears to think that the lowest ebb has been touched in this regard, however, by a Welsh offer of an engagement to a "thoroughly experienced person, with practical knowledge of electric lighting," who is expected to "fill spare time in a grocery store room." Gas managers are set very low down in the employment market sometimes, if one may judge from advertisements that occasionally see the light; but a lower deep still has been reserved for electricians.

Eastern Counties Gas Managers' Association.—The sixth general meeting of this Association will take place, by permission of the Mayor (Mr. F. C. Wace, M.A.), in the Council Chamber, Cambridge, to-morrow week, under the presidency of Mr. John Carter, of Lincoln. According to the *agenda*, a copy of which we have received from the Honorary Secretary and Treasurer (Mr. Harry Wimhurst, of Sleaford), five new members will be proposed for election. Two papers are to be read—one on "The Economical Working of a Small Gas-Works," by Mr. F. Weller, of Southtown, Yarmouth; and the other on "The Rating of Gas-Works," by Mr. F. A. Ward, of Amersham. These will be followed by a discussion on "Coal Storeage, viewed with regard to the combination of the Mining Interests to the detriment of the Gas Industry," to be opened by Mr. C. E. Jones, of Chesterfield. The remaining business will consist of the election of officers and the selection of the place for the spring meeting next year. These matters having been disposed of, the members and friends will visit some of the colleges, the gas-works, and other objects of interest in the city; and the day's proceedings will conclude with a dinner at "Ye Olde Castel Hotel."

MR. FORSTER BROWN UPON OUR COAL RESOURCES.

The thoughtful paper, on our national coal resources, read by Mr. T. Forster Brown, M. Inst. C.E., before the Economic Science Section of the British Association meeting at Cardiff, and reproduced in last week's Journal, is a composition of a class which might with advantage be more numerously filled than it is. The subject of the probable duration of the British coal-fields is one that can never be indifferent to our readers, who must always be conscious that, as a body, the gas managers of the world are among the greatest dispersers into its original elements of the coal capital of the United Kingdom. It is impossible to witness year after year the immense stores of coal that are poured into British and foreign gas-works from the coal-fields of England and Wales, to say nothing of Scotland, without realizing that some day the apparently inexhaustible sources of this invaluable mineral must be worked out, never to be replenished. Gas managers, as a rule, are the most careful of men in the matter of checking and preventing waste of coal when once it comes into their hands. The casual observer might be led to imagine that the habit of dealing with thousands of tons of the mineral yearly would have a tendency to betray the gas manager into neglect of the small economies of his raw material. But nothing could be further from the truth than such an opinion, as would be seen by the same casual observer if he were to accompany the next gas manager he might meet in a walk through his works. Here every lump of coal is usually taken care of as though it were the last in the store; and no thought of soiling his fingers will prevent the well-trained manager from carefully picking up a stray piece of coal, infinitesimal though its money value may be, and carrying it to a proper place. Indeed, the gas manager who would walk heedlessly over a lump of coal would be a bad specimen of his order, whose carelessness would be likely to betray itself in many more important matters. But this is a digression, introduced in order to show that, although they are among the very largest consumers of coal, gas managers are anything but forgetful of the intrinsic worth of the raw material which they treat destructively in such vast quantities. Consideration of the market price of an article does not weigh with the true economist. The good gas manager is equally solicitous to prevent waste, whether his coal costs 8os. or 8s. per ton. It is the thing itself that is precious in his eyes; and none knows more clearly than he what an unpardonable sin is wanton squandering by man of natural wealth which man is powerless to restore.

In dealing with the subject of the coal resources of the United Kingdom, Mr. Forster Brown, we are glad to notice, took up a position very similar to that which has been maintained in these columns whenever the topic has come up for consideration. After discussing the probable duration of the remaining stock of coal that can be put upon the market without permanent enhancement of price, Mr. Brown takes up the question of the amount of capital that has been sunk in public and industrial works on the faith, so to speak, of the national coal supply holding out for an indefinite period; and he argues that provision ought to be made for the repayment of this capital while the age of cheap fuel lasts. We briefly propounded this grave question when referring recently to the amount of the municipal indebtedness of this country; but Mr. Brown goes into the matter, as may be supposed, much more fully. He puts the question as follows: "Are we justified, as a nation, in heaping up capital outlay in such works as railways, docks, water and drainage, and lighting, and in municipal and county charges, which outlay has only been rendered necessary for the accommodation of the numerous population and the extensive manufacturing industries made possible by the rapid development of our national resources of cheap and good fuel, without making any substantial provision for the repayment of the capital within the period in which this wonderful gold mine to the nation of cheap fuel will last?" Thus stated, the query admits of but one answer: We are certainly not justified in doing anything of the kind. The matter may be treated experimentally, by stating an imaginary case. Let us suppose that a mountain of ore has been discovered in an uninhabited region, destitute of means of communication—where the land, in short, possesses only the "prairie value." The amount of the ore deposit is accurately known, we will say; and it is capable, when the necessary arrangements are developed, of being worked out at a rate which will exhaust it in x time. Roads, railways, and canals must be made to the site, and gas and water works built to supply the town that will arise for the accommodation of the population dependent upon the working of the mine. Everybody knows that all these works only possess temporary value, and that the time must come when the site of the works and town will revert to the original condition of prairie, incapable of supporting one family per square mile. In such a case, it is clear that a sinking-fund must be the accompaniment of every investment in local works, unless the capital so invested is to be sacrificed. This is precisely what Mr. Forster Brown recommends to be done for all railways, gas and water works, &c., so that, after a calculable period, the capital outlay upon these classes of property being wiped out, they could be worked for the benefit of the country at charges just sufficient to pay for maintenance and running expenses. It is not for us to criticize the financial aspect of this scheme, which involves a gigantic plan of national

purchase or insurance. Mr. Forster Brown proceeds upon the assumption that the nation undertaking all this additional responsibility—far exceeding in amount the existing National Debt—could still borrow money at 3 per cent. for the purpose of extinguishing liabilities at present costing more. Here, we venture to think, he would, in the course of application, discover a "hole in the bucket" of his calculation, and not a small one, for a scheme intended to "hold water," in the financial sense. We do not insist upon this point of criticism, however, but desire to examine Mr. Forster Brown's plan with special regard to the details in which we are more immediately interested.

Statutory gas companies are, as a matter of fact, unable to provide anything of the nature of a sinking fund for the extinction of their capital obligations. When gas supply is carried on under the conditions of a terminable concession, as in many foreign countries, amortization is a necessary feature of the capital arrangements; and municipalities in the United Kingdom are only permitted to own gas undertakings upon a similar principle. That this is the right system few will dispute. The chief drawback to it in actual experience is the propensity of such municipalities to "eat their cake and have it," by paying out of gas profits subsidies in aid of current rates, while at the same time redeeming their obligations. If they would do only the one thing at a time, and confine their attention to the most essential duty, the advantages of municipalizing gas supply would be more apparent than they are. Mr. Forster Brown does not separately treat the redemption of gas and water undertakings from that of railways and canals; but the general tenor of his advice may be seen in the simple direction which he applies to the whole. He takes the present value of railways, docks, canals, and gas and water works at £1,350,000,000 in round numbers; and he states that the purchase of the reversion of this sum in 75 years, with money at 3 per cent., would cost less than £5,000,000 per annum, "which would be the maximum cost, therefore, to the nation, under any circumstances, to secure the reversion of all these properties, and free the means of communication and gas and water." It is a tempting prospect, and so cheap! Just another 6d. a gallon on excisable liquors, and a trifle higher duty on tobacco, and the thing would be done. In the latter case, the time-honoured gas companies' motto, "*Ex fumo dare lucem*," would receive a new application.

Unfortunately, we cannot admit that Mr. Forster Brown's treatment of the problem, heroic as it is, would suffice for its complete solution. If we must make our coal capital pay for railways, gas and water works, and even tramways and electric light installations, we cannot leave out the national and municipal debts. This would double the bill at once; and even then finality would not be attained, for there would still be the progressive increases to be met. Why not create a a National Insurance Fund, by putting a tax of 6d. or 1s. per ton upon all coal to be raised henceforth in the kingdom? It would be replied that the investment, and still more the ultimate partition, of such a fund would present insuperable difficulties. But the same remark applies equally to Mr. Forster Brown's scheme. In truth, it is well-nigh impossible to insure a nation's prosperity. Universal history has no more salient teaching than this. The United States are living at a high rate upon the unexhausted fertility of the corn and cattle raising lands of the West. When these are like New England now is, the country will have to be reorganized upon a different basis from M'Kinleyism. We are eating up our coal; and when it is all gone our descendants will have to decide, according to results, whether or not we have made a prudent use of it. Is the exhaustion of internal resources to serve the purpose of extinguishing effete civilizations in the future, as foreign irruptions and internal weaknesses ended those of the past? Who can say? We must work according to our lights, while it is yet day with us. It is at any rate wisdom to faithfully do the duty that lies closest at hand; and with regard to coal, this duty unquestionably is to avoid waste in using it, and to make our store go as far as possible. So far as modern gas manufacture is concerned, it is little liable to reproach on this score. There is no finality in human knowledge. But an industry which accounts so completely for its raw material as does that of gas supply, is at least justified in the present. Paradoxical as it may sound, the saying is true that the more British coal there is converted into gas, the longer will the supply last; for most other applications of the material are less economical than this.

If we have criticized Mr. Forster Brown's paper somewhat adversely to his conclusions, this is not because we hold it to be anything else than a worthy and instructive contribution to the literature of a particularly puzzling qnestion. Such a paper was worth doing; and Mr. Forster Brown has done it well.

Mr. Corbet Woodall, M. Inst. C.E., has been appointed by the Manchester Water Committee to carry out the arrangements in connection with their hydraulic power scheme.

The Forthcoming Electrical Exhibition at the Crystal Palace.—The electrical exhibition which is to be opened at the Crystal Palace on the 1st of January next has received the sanction of the Board of Trade, and has been certified as an "international exhibition" under the provisions of the Patents, Designs, and Trade Marks Act, 1883.

LETTING HIGH-POWER LAMPS ON HIRE.

In the United States, where competition with the electric light is more real than it is in this country, it has become a very general custom for gas companies to let high-power lamps of the regenerative pattern on hire, just as in England we lend gas-stoves. The objects in view are rather different, though not without some points of analogy. It was thought that a considerable number of people would be willing to burn gas through the medium of gas-stoves, but were prevented from doing so by the first cost of these appliances, and a natural disinclination to incur an outlay of perhaps several pounds on a new and, to them, unknown apparatus, which might after all prove to be unsatisfactory. So far the hiring out of gas-stoves has proved a great success, as a means of developing an important department of gas consumption. At first some directed their attention exclusively to cooking stoves, in the hope of establishing a summer sale; thus increasing the proportion between the maximum daily output and the annual consumption, and enabling a larger business to be met without a proportionate increase of plant. Such anticipations have, however, gradually been dropped. It was found that gas cooking-stoves, once introduced, were used all the year round alike; and so the idea of bringing out a specially profitable line of business became merged in the broader view of an all-round increase. Placing ourselves in a similar position, with regard to the possibility of a high-power lamp department of gas consumption, to that one might be supposed to have occupied at the time when the letting of gas-stoves first attracted general attention, it is desirable to examine the available information on the subject.

That a considerable demand exists, especially among shopkeepers, for brilliant lights, ranging from 40 up to 100 candles or more, is shown by the extent to which large oil and petroleum lamps have come into use within the last few years. It is not too much to assume that the place of many of these would be occupied by gas-burners of similar power, if the public were properly acquainted with the economy in gas consumption afforded by a good regenerative gas-burner. They are too apt to judge this by a rough comparison with ordinary batswing or fishtail burners; thus arriving at a very high result. There is not only the dread of a heavy gas bill, but the high price in the first place, together with the fact that some of the earlier makes of this form of gas-burner have not been a success, has aided in leading the gas consumer to look upon it with some hesitation and distrust. As with the stoves, we have the fact before us that a few gas engineers—probably more enterprising than others, and perhaps having more promising facilities—have taken up with a considerable amount of success the hire of large-sized gas-burners. In England we have not the stimulus of a cutting competition to press gas companies to the adoption of every possible means of either holding or increasing their business; but it is none the less desirable that they should be awake to any means, either of meeting the wants of their customers, or of strengthening their position.

It may be questioned whether the suppliers of gas have, as a rule, given sufficient attention to the subject of high-power gas-burners. If the public are to use them extensively, they must be taken in hand just as the cooking-stoves have been; and with the enlarged demand we may hope for a gradual improvement in quality and reduction in cost. The ultimate limit of duty per cubic foot of gas consumed is not yet reached; and there is room for some economy in construction. At the same time, it is useless for gas companies to wait for these; and the advancement already obtained would warrant the letting out of such lamps on favourable terms, under a guarantee of efficiency, and the company maintaining them in good working order. The gas supply must be properly adjusted, the glasses and air passages kept clean, together with one or two other little matters of detail with which the consumer will readily become acquainted after a time, but cannot be depended upon to appreciate at first. This is not the place to recommend particular patterns; but there are in the market several kinds of regenerator lamps which may safely be adopted and introduced to consumers. The better plan is to try some of them first at the works. They can be fitted up for regular use in the offices, exhauster-room, meter-house, &c.; and thus the inspectors employed by the company will be enabled to acquire that practical experience in their daily use which is indispensable before they can be safely trusted to introduce them into the district.

The advantages peculiar to this form of burner are numerous. As compared with the ordinary flat-flame burner, it gives a steady and more brilliant light with a much smaller proportionate consumption of gas. More than this, the light is, if we may so express it, of a better class. It is as far superior to the common methods of gas lighting as the new-pattern oil-lamps are to the cheap flat-wick ones. The regenerator burner lends itself readily to any scheme of ventilation, or to feeding the flame by an independent supply of air. Being entirely enclosed, it is as safe from risk of fire as any flame possibly can be. Shop windows can be well lighted from outside; thus avoiding all risk of the heat, damp, and injury to goods that are due to the excessive use of gas in an insufficiently ventilated space. For this reason, the regenerator burner commends itself especially to grocers, provision merchants, jewellers, and all who show goods of a perishable or tarnishable character, as a great advance on many

of the forms of outside window-lighting apparatus at present in use. It is not too much to say that a good regenerator burner affords many of the advantages peculiar to oil or to electricity, combined with the convenience, safety, and reliability that are the special features of gas.

But it is not contended that the regenerator burner is a perfect appliance to be adopted anywhere and everywhere. The fact that many shops and rooms are not suited to it must be recognized, as it has been prejudiced by being fixed in places not adapted to its powers. To be effective, the flame must be not less than 12 feet from the ground; and then the structure is such that at least another 3 feet to the ceiling is needed, making 15 feet in all. For many shop-windows, the best position for the light, apart from the other advantage above mentioned, is on the outside, level with, and if necessary a little above, the top edge of the glass, and not more than 2 feet away from it. The three-sided opal reflectors frequently used, presumably for the purpose of throwing the light upon the contents of the window, are not a success. They concentrate the light instead of diffusing it; and a much better effect is obtained with no reflector at all, notwithstanding the fact that the pathway and part of the road are also brilliantly lighted. The whole contents of the window are illuminated with a steady, soft, white light, which leaves nothing to be desired. As at present made, the shape of the regenerator burner is heavy and awkward; and this defect is not ameliorated by loading it with scroll and foliated metal work, &c. The gas supply must be carefully adjusted in the first place, and regularly maintained at a constant rate by an accurate automatic governor. Even then any marked alteration in the quality of the gas supplied will cause it to smoke.

On the whole, gas companies will, we think, do well to undertake the hiring out of regenerator burners at a moderate quarterly rental, with the usual liberal terms that have been so successfully adopted in the case of gas-stoves. After fixing, a man should be sent at regular intervals—say, once a fortnight—to see that the appliance is in proper order. They will thus obtain a considerable increase of business, a good advertisement for the gas, and, what is of more importance than all, they will encourage that good understanding with their customers which has already been inaugurated by the introduction of stoves. Gas companies have often experienced the disadvantage of having to stand aside and see incompetent persons advising the consumers as to the best way of using gas. In introducing gas-burners, they are taking another step towards a better state of things. Of course, the idea is open to objections, which are generally raised to anything novel. Some will say it would be better to await further improvements. This practically comes to an adjournment of the matter *sine die*. Others will bring forward the well-worn objection that gas engineers already have enough on their hands. But the competition from other sources of light does not become less, nor will it do so; and it is much easier to introduce a new movement quietly and unostentatiously, while the ground is in one's possession, than bring it forward under the excitement of spirited competition or opposition.

NOTES.

A New Reagent for Oxygen Determinations.

A memorandum on experiments designed to facilitate the quantitative determination of oxygen in gaseous mixtures has been communicated by M. de Koninck to the *Revue des Mines*. The author remarks that the number of reagents proposed for this purpose is very considerable, and the greater number of them are open to objections. Potassium pyrogallate is the substance most frequently in use, at least for industrial determinations relating to furnace gases, &c. But this reagent leaves something to be desired in several respects. It has the defect of sometimes occasioning the formation of a small quantity of carbonic oxide—thus introducing an error; and its use with Bunte's burette is disagreeable, as it is extremely alkaline, staining strongly whatever it touches. Moreover, its price is very high. To avoid these inconveniences an attempt has been made to return to the use of metallic solutions. Ferrous salts were first tried. Alkaline solutions had to be employed for the sake of speed in working. The reagent was obtained by taking, separately, 40 grammes of crystalline ferrous sulphate, 30 grammes of Rochelle salt, and 60 grammes of commercial potassium hydrate. Each substance is dissolved in the quantity of water necessary to make up 100 c.c. of solution, when one volume of the first is passed into five volumes of the second; whereupon a precipitate is formed which disappears on the immediate addition of one volume of the third solution. The result is a light yellowish solution, which if exposed to the air turns green. When used in a double Hempel's pipette for air analysis, the results showed, as the mean of four determinations, 21 per cent. of oxygen. If the pipette is agitated, the absorption of oxygen is fairly rapid. In air analyses, the oxygen is completely absorbed in four minutes.

The Mechanical Equivalent of Heat.

M. Constantin Miculesco has sent a report to the Académie des Sciences upon a new determination of the mechanical equivalent to heat. The principle of this method is the same as Joule's; the production of heat in the calorimeter being by friction. In the classic experiments by which Joule determined the mechanical equivalent of heat, the whole amount of work done was small; so that a considerable period of time was necessarily occupied in developing sensible heat in the calorimeter, and some difficult corrections had to be made. To avoid these inconveniences and obtain a result upon a larger scale, M. Miculesco used a fairly powerful electro-motor to supply the mechanical energy which was to be converted into heat. His apparatus comprised a 1-horse power Gramme electro-motor, carried on a frame suspended on knife-edges; the motor shaft being central with the line of these bearings. Upon a separate frame was mounted a calorimeter consisting of two concentric cylinders; their axes coinciding with the centre line of the motor shaft. By means of a flexible connection, the shaft of the motor was coupled to the paddle-spindle inside the calorimeter, where it caused the latter to revolve in water. In these circumstances, the frame carrying the motor tended to swing on its knife-edge bearings, in order to balance the torsion on the motor shaft, and by neutralizing this tendency by the addition of weights, the amount of torsion of the shaft could be measured with great accuracy. The result that was thus obtained by M. Miculesco was to make the mechanical equivalent of heat, or J, equal to 777·7 foot-pounds. The usual figure is 772 foot-pounds.

Naphthalene Deposits in the Inlet-Pipes of Gasholders.

Mr. J. J. Rowe, Manager of the Cairo (Ill.) Gas Company, has sent to the *American Gaslight Journal* a few notes respecting his experience in ridding himself of naphthalene deposits in the inlet-pipes of gasholders. He says: "About a year ago I found the back pressure increasing daily from the holder. The inlet-pipe was tapped for steam, and a steam-pipe attached near the inlet-valve; the valve-house being situated about 30 feet from the holder. I turned on steam; and this worked admirably well for a time, until I found I could pump no water out of inlet drip at the holder. I then inserted a small iron rod into the drip-pipe, and found, at the bottom, what I thought to be naphthalene in a crystallized form. It had accumulated round the suction-pipe in a solid mass. This I attributed to the use of steam, as, in my judgment, the steam merely softened the naphthalene; allowing it to settle back in the drip, where it subsequently hardened into crystals. Having two holders to work into, I was afforded an excellent opportunity to experiment with them. I filled the drip-pipe with naphtha of 63°, when, in a few minutes, I noticed that the naphtha began to settle. I tapped one of the bonnets on the holder, directly over the inlet-pipe, and inserted a ¾-inch pipe with funnel attached. I then poured in about 6 gallons of naphtha, and, where steam connections had been made near the inlet-valve, about the same quantity; and I allowed the whole to remain over a night. In the morning I pumped the inlet drip, and extracted therefrom what naphthalene had been dissolved by the naphtha and held in solution thereby. This gave me a passage into the holder. After again pumping the drip that evening, I poured in a few gallons, as before, and allowed it to remain for a night; pumping the inlet drip again on the following morning. This completely relieved the trouble. I then cut out the steam-pipes, with the intention of not using them again; and I never have. About once or twice a month I insert, at the points named before, a few gallons of naphtha; and I have not, since pursuing this course, experienced any further trouble with naphthalene. Steam is employed by a great many engineers for the removal of naphthalene deposits; but, in my judgment, it ought never to be applied where naphtha can be. It may remove the trouble for a time in one place; but deposits will form elsewhere that will prove equally as annoying, if not more so. I have found that, where rapid condensation takes place, naphthalene deposits itself freely. Our condensing capacity is rather small for the quantity of gas made; and, as a consequence, the gas enters the inlet-pipe, in the ground leading to the holder, at a few degrees higher temperature than it should do ordinarily."

The Odour of Acetylene.—Professor Meyer, having lately prepared pure acetylene in order to describe it accurately in a text-book by himself and Dr. Jacobson, has found, says *Industries*, that its odour has no resemblance whatever to that produced by a Bunsen burner alight below, although this has always been supposed to be, and quoted as, the best example obtainable.

Resignation of Mr. P. H. Wilkinson, of Harrogate.—We regret to learn that Mr. P. Haines Wilkinson has been compelled to retire from the position of Engineer and Secretary of the Harrogate Gas Company, after a period of service extending over 31 years. He is succeeded in the secretaryship by Mr. Harry Wilkinson, whose connection with the Company has been, within four years, as long as that of his predecessor; and Mr. G. S. Sayner, who has been Assistant-Manager of the works for the past five years, has been appointed Engineer. Mr. P. H. Wilkinson has been elected a Director of the Company; and at the half-yearly meeting on Monday last week, when these arrangements were confirmed, the Chairman (Mr. C. Allanson) expressed the hope that the new member of the Board would soon be restored to health, and that the Company would continue to derive the benefit of his ripe experience.

TECHNICAL RECORD.

GAS SUPPLY IN THE HANDS OF LOCAL AUTHORITIES.

In the JOURNAL for the 4th ult. (p. 202), we briefly noticed a paper on the above subject, read by Mr. J. HEPWORTH, M. Inst. C. E., Gas and Water Engineer of the Carlisle Corporation, at a conference of the Association of Local Boards held in London on the previous Thursday. We have since been favoured by the author with the text of the paper, which is as follows:—

The subject of gas supply is one of considerable importance to local authorities; and while it has not been neglected by them in the past, it should continue to receive their careful attention in the future.

Although gas for lighting and other purposes has only been introduced within the present century, it has practically become one of the necessaries of life; and notwithstanding the competition of other illuminants, there is no evidence as yet that it is likely to be superseded—its use, both for lighting and heating purposes, being largely extended every year.

There are at the present time some 1600 gas-works in the United Kingdom; and from the return relating to all the authorized gas undertakings, it appears that 578 out of the total number of works have been sanctioned by Parliament. Of the authorized undertakings, 405, or about 70 per cent., belong to companies; and the remaining 173, or nearly 30 per cent., belong to local authorities. The capital employed in the gas-works of the United Kingdom has recently been estimated at £100,000,000; but the total capital employed in the authorized gas undertakings only in 1890 was as follows:—

Authorized Gas Undertakings.	Total Number.	Capital Employed.	Per-centage.
Companies	405 ..	£38,207,748 ..	63·81
Local Authorities . .	173 ..	£21,669,789 ..	36·19

The local authorities, with the exception of a few instances, did not undertake the responsibility of gas supply when gas was first introduced. It was only after it had been proved to be a great public convenience, and its supply had been established as a commercial success, that public bodies, as a rule, became convinced of the importance of undertaking the supply. Some of the arguments adduced for local authorities assuming this responsibility are: That gas is a public necessity; that its supply has become a monopoly; that the supply of a commodity necessitating frequent interference with the public thoroughfares should be in the hands of the public authority having charge of those thoroughfares, and not of private individuals; that the security of the public rates enables local authorities to raise money at a cheaper rate than gas companies, and therefore to manufacture gas at a less cost than companies can; and that any benefits derived from the supply of gas should go, not to private individuals, but to the public—either in the promotion of public improvements, the reduction of the public rates, or reductions in the price of gas.

There is no necessity to discuss these arguments now. They have been advanced with more or less force by local authorities; they have been sanctioned by the Legislature; and the following General Acts of Parliament for establishing or acquiring gas undertakings have been passed as the result: The Gas and Water Works Facilities Act, 1870, and its Amendment Act of 1873; the Public Health Act, 1875; and the Burghs Gas Supply (Scotland) Act, 1876. The Public Health Act, 1875, enables urban sanitary authorities to become suppliers of gas by the purchase of gas undertakings already in existence, and to supply gas within their district by themselves erecting gas-works under the powers of a Provisional Order to be granted by the Local Government Board, or by obtaining a Special Act to effect the same purpose. The Burghs Gas Supply (Scotland) Act, 1876, also confers similar powers upon local authorities in Scotland.

The powers conferred by these several Acts have been extensively used, albeit not so extensively as seemed probable at one time; and some of the largest provincial gas-works have now been acquired by local authorities, and are supplying gas to areas much larger than the district of the authorities in question, and with manifest advantage to all concerned.

It is unnecessary to discuss the relative advantages of a Special Act or a Provisional Order enabling a local authority to acquire a gas undertaking; these can only be determined on a full consideration of the circumstances in each case. But wherever a local authority finds it desirable to supply gas outside its own district, it is then necessary to obtain a Special Act; and the fact may be noted that there are comparatively few authorities supplying gas who have not found it either desirable or necessary to have a Special Act for the purpose.

The Legislature does not give power to local authorities to compete with any authorized gas undertaking; but there are instances where local authorities have succeeded in obtaining powers to establish gas-works in districts in which a company has already been legally authorized. In all cases, however, Parliament has properly refused to assist in confiscating the property of the private company, and has limited the powers of the local authority to a supply of gas to the public lamps and other public purposes of such local authorities. It need scarcely be said that such a limitation precludes the possibility of any advantage whatever to the local authority; and the loss of the public lighting has not in all cases proved to be a disadvantage to a gas company. In cases where gas-works already exist, the only way in which the local authority can succeed in effecting any beneficial result is by first buying up the established company; and wherever a local authority has succeeded in obtaining the powers of supply, it has been with the condition attached that the rights of the existing company should be purchased by the local authority.

The capital employed in the gas undertakings of local authorities has already been given at £21,669,789. The terms allowed for the redemption of this capital vary from 30 to 100 years. But the usual maximum is 80 years; and the tendency of late has been to reduce that limit. In the author's judgment, 50 years ought to be adopted as a minimum term for the repayment of capital employed in gas-works. With a less limit than this, there is an inducement either to erect works of an imperfect character, or to allow the works to become dilapidated. The result in either case is that the cost of maintenance becomes ultimately excessive; and the excessive cost of gas under such conditions follows as a natural sequence. On the other hand, if the works are properly constructed in the first instance, and the cost of maintenance is kept reasonably low, the works may prove a valuable asset even at the end of 50 years. Moreover, when gas companies authorized by Parliament are permitted to maintain their capital in perpetuity without any reduction, the conditions imposed upon local authorities, of repayment within a shorter period than 50 years, become not only onerous, but retard the benefits which ought to accrue to local authorities in the earlier periods of their gas undertakings.

The rate of interest at which local authorities have been able to raise the capital employed in their gas-works varies from 3 to 5 per cent.; but it is not now necessary to give much more than 3 per cent. The importance of this fact may be estimated when it is remembered that the dividend paid on capital employed in the authorized gas-works owned by companies in 1890 averaged £8 11s. per cent. There can be no doubt as to the advantages possessed by local authorities over gas companies in respect to the terms on which they are able to raise capital; and assuming that a gas undertaking has been acquired at a reasonable price, and that other things are equal, the possession of the undertaking ought to prove a substantial public benefit.

The terms upon which the transfer of a gas undertaking to a local authority takes place are usually arrived at by arbitration; and in the case of a statutory company, the amount in recent years has varied from 25 to 28 years' purchase of the maintainable profits—the amount differing according to the circumstances of the case. When the undertaking is not an authorized one, the value is proportionately less, and has in several instances been taken at about 20 years' purchase of the maintainable profits—circumstances again governing the amount awarded.

The benefits which have accrued to the local authorities from the possession of gas undertakings have been greater than is generally recognized; and if, in exceptional cases, gas-works in the hands of local authorities have not proved so profitable as might have been anticipated, this has usually arisen from mismanagement on the part of the authorities themselves. The benefits arising from the profits derived from the gas supply and from reductions in the price of gas may be especially noted.

Profits from the Gas Supply.—There are differences of opinion as to the advisability of local authorities supplying gas at a profit; and the Burghs Gas Supply (Scotland) Act, 1876, expressly provides that the gas shall be supplied at such a price "as will, as nearly as can be estimated, raise sufficient income to discharge all the costs and expenses of and incident to the manufacture and distribution of the gas made, together with the interest on all money borrowed in respect of the works, and to provide the sinking fund required by this Act, and to provide for a depreciation and renewal fund sufficient to maintain the works in perpetuity, and for all charges incident to the occupation of such works; and the moneys received in respect of and incident to the manufacture and distribution of gas shall be applied to such purposes only, and any balance at the termination of every year shall be carried to the debit or credit of the succeeding year." That is to say, no profit is to be made. This provision of the Burghs Gas Supply (Scotland) Act, 1876, has not been incorporated in any Act relating to England and Wales; and the practice of the local authorities accordingly varies.

The total amount of net profit actually realized by local authorities on their gas undertakings in 1890, after payment of interest on loans, annuities, repayment of loans, and amount placed to redemption and sinking fund, was £486,483, which is equal to 2¼ per cent. upon the gross amount of money borrowed, not deducting the amount repaid. As 2¼ per cent. does not represent the whole of the difference between the rate of interest or profits paid upon the capital employed in the gas-works of local authorities and of gas companies, it may be safely assumed that the consumers have not had to pay a higher price to local authorities for their gas than they would have been called upon to pay to gas companies; but, when examined, the prices charged by local authorities for gas prove that this is so.

The net profit referred to, amounting to £486,483, has been applied in various ways—viz., to a reduction of the capital account; to extension of works; to meet deficiencies in the

water accounts (as was lately proposed also in the Manchester Corporation); to the free lighting of the public lamps; to defray the cost of the electric light, the cost of municipal buildings, markets, free libraries, and public improvements; and to the city or borough fund, and also to the district fund, in aid of rates. There may be some doubt as to the wisdom of such application of gas profits; but the fact remains that a sum of nearly half a million pounds sterling was thus applied last year. The effect of such an application of profits is to maintain a higher price for gas than is absolutely necessary. If such a policy can be justified at all, it may, perhaps, be justified by the theory that a local authority has a right to make as much profit as a private company would be allowed to make in similar circumstances.

The author's view is that all local authorities should follow the practice compulsory upon the local authorities in Scotland, and sell gas at cost price, certainly within their own district, and especially when "cost price" does, and in every case must, include the amount necessary to extinguish the capital of the undertaking within the prescribed number of years. The price at which a local authority should supply gas to an outside district may, as in the case of companies, very properly be in excess of that charged within its own district; and the amount of the excess is usually regulated by the distance which gas is conveyed, the consumption per mile of main, and other local circumstances. If the gas-supplying authority derive a reasonable margin of profit in such a case, it should not lead, as it sometimes does, to discontent on the part of those receiving the supply. A legitimate profit is not only reasonable, but in the case of a local authority will probably be less than would have been paid if a company had supplied the gas; and if the profits are being contributed by one district to an adjoining district, the hardship, if it be one, is no greater than would exist if the profits had been contributed to a gas company, whose shareholders might by chance reside in every district in the United Kingdom. As I have said elsewhere, however, it must be left with the local authorities themselves to determine their own policy in this matter.

Price of Gas.—The lowest price charged for gas in the United Kingdom in 1890 was 1s. 9d. per 1000 cubic feet; and the gas was supplied by a company. The lowest price charged by any local authority was 1s. 10d. per 1000 cubic feet. If it be true, as is sometimes alleged, that the price charged for gas supplied by local authorities is higher than it need be, it cannot be said that it is anywhere excessive when compared with the prices charged by companies under similar conditions; and certainly the price of gas has been steadily reduced by nearly all local authorities when they succeeded to the gas undertaking of their respective districts.

One of the greatest hindrances to the reduction in the price of gas in the case of local authorities arises from a tendency to entrust the management of their works too much either to members of such authorities or to incompetent managers; and this tendency exists not only in small gas-works, but in several of the largest in the country, and is absolutely without excuse. There are notable instances of local authorities, selling gas at admittedly low prices, who, if their works were under good management, could largely reduce the cost of production, and effect the annual saving of large sums of money now being wasted; but this economy might involve new principles of management, the introduction of better qualified officers, and possibly an increase in salaries. In the interests of economy and efficiency, however, and also with the view of improving the quality as well as reducing the cost of gas, local authorities would do well to consider the possibility of improving their methods of management.

From the fact that there have been only 25 gas undertakings acquired by local authorities during the last eight years, it may be inferred that the introduction of the electric light has had, and still has, some influence in deterring these authorities from assuming such risks as are attached to the supply of gas. It has already been stated, however, that, notwithstanding the competition of all other lighting agents, the increase in the consumption of gas continues from year to year. The value of gas undertakings, therefore, has in no degree been depreciated in consequence of that competition—indeed, their value has been, and still is, steadily increasing; and it is a striking fact that the consumption of gas for other purposes than lighting (the "day" consumption as it is termed) is not only extending, but in some towns now amounts to 50 per cent. of the total consumption.

The obvious conclusion is that those who are in possession of authorized gas undertakings have no reason to fear the future of their industry; and, speaking from a 25 years' experience as the engineer of gas-works belonging to local authorities, the author is of opinion that authorities either in possession of, or seeking to possess, such undertakings, will find that gas-works in their hands will continue to be one of the most valuable of their undertakings.

Steel Water-Mains, 5 feet in diameter, and made of plates about $\frac{9}{16}$ inch thick, are to be used for conveying water from the reservoir at St. Cloud to the Porte Autueil, Paris. The pipes will be manufactured in lengths of 20 feet, and will be lapped at each end by welded steel hoops. The total extent of main will be about $2\frac{1}{4}$ miles.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

As briefly stated in last week's JOURNAL, the members of the above Institution held their Quarterly Meeting at Birkenhead on the previous Saturday. An exceedingly interesting programme was arranged; and the attendance of members and friends was one of the largest on record. Most of the party assembled at the Central Station, Manchester, and journeyed by the 10.30 a.m. train to Liverpool, where they were joined by others, and were cordially received by the President (Mr. T. O. Paterson) and the Chairman of the Birkenhead Corporation Gas and Water Committee (Mr. H. Bloor). Waggonettes conveyed the whole of the party from the station to the landing-stage, whence they proceeded by the ferry to Birkenhead. The morning broke dull and unpromising; but by this time, the sun was shining brilliantly; and during the rest of the day the weather was delightful.

An Ironclad in Construction.

On arriving at Birkenhead, a visit was paid to the shipbuilding yard of Messrs. Laird Bros., where the ironclad *The Royal Oak* is being built for the Government. Mr. Henry Laird having given the visitors a cordial welcome, they were conducted over the new vessel by Mr. M'Culloch, Mr. Gibson, and Mr. Simpson, three of the chief employees.

Before leaving the works, Mr. J. Chew (Blackpool) proposed a vote of thanks to Messrs. Laird Bros., for their kindness in permitting the visit. As Englishmen, they were, he remarked, all proud to know that there were private firms in the country capable of undertaking a contract so heavy as that involved in the construction of a ship of the size of *The Royal Oak*. It reflected the highest credit upon Messrs. Laird and their staff that they could do work like this, and do it quickly.

The vote of thanks having been carried by acclamation,

Mr. Henry Laird briefly acknowledged it.

Visit to the Gas-Works—Coze's Inclined Retorts.

Conveyances were again waiting for the party as they left Messrs. Laird's; and in a few minutes they were at the Corporation Gas-Works. Here Mr. Bloor offered them a hearty welcome in the name of the Gas and Water Committee. The Committee and their Engineer (Mr. Paterson), he said, worked most harmoniously together; and they were proud of the fact that they produced excellent gas of 20-candle power, and sold it during the last year without any increase in the price—in fact, with a slight reduction.

Under the guidance of Mr. Paterson, Mr. Bloor, and the members of the Committee, a tour was then made of the works. In the meter and governor house, there is a new meter just put up by Messrs. Braddock, of Oldham, with a capacity of 100,000 cubic feet per hour. This is not yet in use; but the connections will be completed and all put in readiness before the winter season sets in. A conspicuous feature of the works is an elevated tower into which the tar and liquor are pumped, and from which they flow to the river level for shipment. But most interest attached to the experiment which is being made with Coze's system of inclined retorts. Mr. Paterson has at the present time four settings on this principle, or 28 mouthpieces in all. The retorts are 11 ft. 6 in. long; and two or three were drawn and re-charged, in order that the members might see them in actual work. One very noticeable fact was that the men drawing the retorts were much cramped for room. Mr. Paterson explained that the settings were put up in accordance with the plans of the Company; but if any extensions were made of inclined retorts, far more room would be allowed for working them. They had experienced some difficulties which they did not expect to find, especially in charging the retorts. The shoot at the top, which passed the coal into the retorts, had a tendency to become clogged; and this had caused trouble with the men, and led to additional expense in working. He believed that this difficulty would be overcome; and if it were the system would be very successful. They had no trouble in getting good heats. This, indeed, was obvious; for the retorts drawn were of a good heat, and the charges well burnt off. It may be remarked that Mr. Paterson's settings have been exceedingly well built. The very finest material was used in the combustion chambers; and the result of the three months' working is to show that in this respect a wise policy was adopted. In an adjoining retort-house, there are three beds of regenerator furnaces; and the house is being laid out with a view to the adoption of hand machinery when the whole of the beds are erected. Some of the settings there have been working for twelve months, and stand as straight as a line.

The Luncheon.

From the gas-works, the party proceeded to the Town Hall, where they were invited to lunch with the Gas and Water Committee. An excellent luncheon was served in the handsome assembly-room. Mr. Bloor presided, and explained that the Mayor would have filled that position had not a pressing business engagement unfortunately called him away from the town. Under the circumstances, it became his duty, on behalf of the Mayor and the Gas and Water Committee—in fact, he might say of the whole town—to offer the Institution a cordial

welcome on the occasion of their visit to that borough. Immediately it became known that they proposed honouring Birkenhead with a visit, the Committee determined to offer them some little enjoyment; and if their efforts had met with approval, they were fully satisfied.

After luncheon, a number of toasts were proposed and duly honoured.

Business Meeting.

The business meeting of the Institution was subsequently held in another room of the Town Hall.

The President, who occupied the chair, expressed his thanks for the excellent attendance. He said he knew it was inconvenient to many members, for Birkenhead was on the fringe of their district, and it must have entailed a great amount of trouble on those who had travelled far to arrive there in time. Although Birkenhead was a modern borough, it had an ancient foundation. A ferry had existed across the river for 1200 or 1300 years; and it had continued until it had come into the hands of the Corporation. He had received a letter from the President of The Incorporated Gas Institute (Mr. W. A. Valon, of Ramsgate), who was sorry that another engagement prevented him being present, but who said that if they would give him an invitation to the next meeting he would attend.

The Honorary Secretary (Mr. S. S. Mellor, of Northwich) read letters of apology from a number of absent members, including Mr. C. Armitage, Senior Vice-President (Lancaster), Mr. J. Hepworth (Carlisle), Mr. C. Eastwood (Linacre, Liverpool), and Mr. G. Smedley (Buxton).

New Members.

Mr. W. T. Goodwin, Manager of the Congleton Gas-Works, was proposed as a member of the Institution by Mr. T. Newbigging (Manchester), and seconded by Mr. H. S. Norfolk (Leek); Mr. J. T. G. Cranshaw, of Tyldesley, was proposed by Mr. J. Timmins (Wigan), and seconded by Mr. A. T. Fletcher (Leigh); and Mr. W. Taylor, of Glossop, was nominated by Mr. T. Duxbury (Darwen), and seconded by Mr. S. S. Mellor (Northwich). These gentlemen were all elected.

Differential Rates.

Mr. T. Newbigging then read his paper on this subject which was given in the Journal last week (p. 396).

The President said it was for the members to decide whether this valuable paper should be dealt with at the present or the next meeting. He feared the discussion would be scamped if they took it now. It was a subject of great importance and many members were interested in it.

Mr. I. Carr (Widnes) remarked that he had objected to some of the postponements of debates; but he thought this subject could be well adjourned. He therefore proposed that the discussion of the paper stand over until the next meeting.

Mr. W. R. Chester (Nottingham) seconded the motion, and it was carried.

Votes of Thanks.

Mr. T. Duxbury (Darwen) proposed a vote of thanks to the Gas and Water Committee, and to the Town Council in general, for the handsome manner in which they had entertained the Institution. They were indebted to them for the use of the Town Hall for their meeting, for the boat which was later on to convey them to Eastham, for permission to view the gas-works, and for the luncheon of which they had partaken. They were much indebted to the Committee in particular for the hearty welcome they had received.

Mr. W. W. Hutchinson (Barnsley) said he had great pleasure in seconding the motion.

The proposition was carried by acclamation.

Mr. Chester moved a vote of thanks to Mr. Newbigging for his paper, which was, he remarked, on a subject of great interest to those connected with corporation gas undertakings. The discussion would not lose anything by being postponed till the next meeting, for no doubt many members would, in the meantime, look up their own experience in connection with the subject.

Mr. J. West (Manchester), in seconding the proposition, also referred to the importance of the subject, and of having it properly discussed.

The resolution having been carried,

Mr. Newbigging said he really thought he had deserved this, for he had saved the reputation of the Institution by contributing something solid to the business of the day. He proposed a vote of thanks to the President for the manner in which he had occupied the chair and conducted the whole proceedings.

Mr. R. Hunter (Chester) seconded the motion, and it was passed.

The meeting then ended.

Subsequently the members proceeded in one of the Corporation's steamers to Eastham, and, by permission of Mr. E. Leader Williams, C.E., the Engineer of the Manchester Ship Canal, walked round the docks at the entrance to the new water-way. Tea at the Eastham Ferry Hotel was followed by a journey back to Liverpool by the steamer. The programme was gone through without a hitch of any kind; and the members and friends present were once more indebted to the Honorary Secretary (Mr. Mellor) and the Committee for an admirably-arranged meeting.

BELGIAN ASSOCIATION OF GAS MANAGERS.

The Testing of Coal.

Some time ago, the Committee of the above Association decided that at each ordinary monthly meeting a technical question of general interest should be placed upon the paper of business, and a member requested to deal with it in a communication to be read and discussed on a subsequent occasion. The first of these special conferences took place recently; the subject selected being the testing of coal, on which a short paper was submitted by Mr. Greyson de Schodt, the Manager of the Namur Gas-Works. An esteemed correspondent, a member of the Association, has forwarded to us a few notes of the principal points in the paper, and the remarks to which it gave rise; and the following is an abstract translation thereof.

Having mentioned in what respects analyses differ from actual trials of coal, the author considered successively the outward characteristics of the mineral, regarded from the standpoints of its appearance, composition, and purity. He showed the influence of moisture on price, storeage, distillation, and condensation; and indicated the way in which the extent of humidity can be easily ascertained. He next proceeded to deal with the constituent sulphur in the coal; discussing its influence on the products of distillation, and the method of finding out its percentage. Passing on to the determination of the volatile matters, he dwelt upon its importance, and explained how it is carried out in practice. He afterwards described the various methods employed for arriving at the yield of gas, and showed how it happens that, contrary to what one would suppose, the results of laboratory tests are lower than the actual yield. Having briefly alluded to the condensable products, the coke, and the ash, the author concluded by stating that there is not in existence at the present time any method that will enable a gas manager who possesses neither laboratory nor special testing apparatus, to ascertain the exact value of a coal for gas-making purposes.

In the course of the discussion to which the paper gave rise, the President expressed the opinion that in many cases a manager who was in the habit of carbonizing coal from a well-known source might ascertain the quality of the deliveries by the simple determination of the volatile matters. This, he said, was a test which could be readily applied by anyone. M. Pettré thought it would be a good thing to publish, in the form of tables, the average results of the tests (made in all gas-works which are provided with apparatus for the purpose) of coals coming from different fields. By glancing over these tables, a manager would be able to ascertain the value for his purposes of any given coal. The determination of the volatile matters, in addition to the examination of the exterior characteristics of the mineral, would furnish a guarantee that the coal being carbonized was of the kind indicated. M. Van Ham remarked that the suggestion to have a series of tables indicating the characters of the coals and their yield under the laboratory test, was certainly a very practical one. Something of the kind had already been done; and the data furnished were most interesting.

M. Greyson de Schodt was thanked for his paper, which it was decided to print and distribute among the members.

Underground Waters.—At the recent meeting of the British Association, Mr. C. E. De Rance read, in the Geological Section the 17th report of the Committee of Inquiry into Underground Waters. He referred to the very great value of these waters for domestic consumption; adding that the work of the Committee for the past 18 years had done much to encourage their utilization. Details were given of a large number of borings in various parts of England and Wales; amongst others, of a trial for water through a very porous and jointed stratum at Coventry, where, unfortunately, it was likely to be polluted by the adjacent sewage farm. The Committee were re-appointed; and a sum of £10 was granted out of the general funds to enable them to continue their work.

A New Departure in Boiler Construction.—Messrs. Fernihough and Sons, of the Victoria Iron-Works, Stalybridge, have made a new departure in the construction of steam-boilers; and, on the invitation of their representative (Mr. Emor G. Wrigley), a very satisfactory test of one of their latest productions was recently witnessed by a party of gentlemen interested in the matter. The boiler was after the Lancashire type, 30 feet long and 7 ft. 7½ in. mean diameter; but it had no Galloway cross tubes fixed in the furnace tubes. The shell was made in ten belts, 13-16ths inch thick, with one plate in a belt. The longitudinal seams were placed to appear above the brickwork, and butted with cover-plates inside and out, and treble riveted on each side of the butt. The circumferential seams were double riveted. The ends, which were of one plate each, were 11-16ths inch thick; the back end being flanged at one heat by hydraulic power. The manholes and stools for the fittings were all double riveted. The flue tubes consisted each of 14 welded and flanged rings, 9-16ths inch thick. The boiler was tested by hydraulic pressure—observations being taken at working pressures of 180 and 280 lbs. per square inch; and the deflection of the end plates was 1-8th inch. The boiler was perfectly dry during the test, and behaved in a most satisfactory manner.

THE RECEPTION AND STOREAGE OF REFINED PETROLEUM IN BULK.

As this subject is one that must call for a share of attention from those who have decided to use fluid hydrocarbons as enriching materials in the process of gas manufacture, no apology is needed for referring to a paper, under the above title, read by Mr. W. O. H. Carrington at a meeting of the Institution of Civil Engineers, and published in a volume of proceedings just issued. The author's experience has included tanks from 30 feet in diameter and 14 feet high up to 74 feet in diameter by 32 feet high. In respect to size, there is some similarity to the receptacles for tar and liquor in gas-works. But here the resemblance ends; for it seems that the accepted practice, with regard to the storeage of petroleum, &c., is to have the whole of the tank above ground, with access to the bottom. If the author's claim that a tank found to be water-tight is also oil-tight, is supported by practical experience, gas engineers will want to know, in the first place, why the petroleum tank cannot be placed underground in company with the tar and liquor tanks. After reading the paper, discussion, and correspondence, however, it appears probable that extra care is necessary, as regards the matter of leakage.

Starting with the assumption that the store-tanks are situated sufficiently near to a water-way to admit of ocean steamers coming alongside a pier, jetty, or quay in connection with the works, the author proceeds to consider the pipes for transferring the fluid to the tanks, then the construction of the tanks, and lastly the arrangements for retailing out the oil. As regards the supply-pipe line, which may, if required, extend to about a mile in length, as shown by practical experience, wrought-iron piping, 6 inches in diameter, is recommended. At the quay side it terminates with a valve and a length of flexible hose, usually made of layers of oiled canvas, wired inside and outside, and covered with an outer layer of tightly-wound Manilla cord. The ends are fitted with gun-metal flanged connections, and joints are made with mill-board and white zinc, or with "Molineaux's composition." The usual pressure on the pipe-line, during pumping, is 20 to 40 lbs. per square inch; and it is perferably laid above ground, and so arranged that it can be promptly emptied when pumping has ceased. This condition only appears necessary when the same pipe is required to pass different qualities of oil. Air-cocks have to be fixed where necessary; and there must be a branch or bye-pass leading to a "dirt-tank." This is simply a settling-tank of about 20,000 gallons capacity, intended to receive the first portions of the cargo, which may be dirty with sediment or mixed with water. After a few days' rest, the impurities settle to the bottom. The author prefers that the inlet-pipe to the tank should be carried in at the top, and descend close to the bottom, terminating in a flat-mouthed nozzle. The object is to avoid "spraying" or vaporizing, and also jarring of the tank by the falling stream. Sometimes the pipe enters near the bottom, and is provided with a swivel joint and arm, so that the oil can be either delivered or drawn off at any desired level. The whole pipe-line is tested to about 60 lbs. per square inch by hydraulic pressure before use; and it is laid, as far as possible, in straight lines with T-pieces at the angles, so as to facilitate the cleaning of the pipe, which is effected by means of a "plunger" in the usual way. A draw-off cock, for sampling or noting the condition of the fluid being pumped, and a safety-valve, complete the fittings of the pipe-line.

The author's views on the subject of the foundation for a store-tank are somewhat peculiar. Many people would take it for granted that the foundation must be firm and solid, and that the structure would not be erected unless these conditions could be secured. On rocky or hard ground this difficulty does not arise; but, from the situation, the chances are that the soil is soft. Bedding the tank on the ground without foundation is objected to as causing the bottom to decay rapidly, as it is not accessible for protection or for repair. A solid concrete foundation adds unduly to the weight put upon the site. Horizontal timbers supported on piles are satisfactory, but costly. So the author prefers an elastic foundation, consisting of a thick layer of brushwood, on which is placed about 18 inches of well-rammed chalk, with a finishing layer of 6 to 8 inches of clean fine ballast. This foundation sinks and rises to some extent as the tank is full or empty. In the first place, the tank is gradually filled with water; and if on bad ground, such as the marshy soil on the banks of the Thames, settlement will proceed gradually for 20 to 30 days. This is not confined to the site covered by the tank, but causes a depression extending over a considerable area of ground. So the actual sinkage is greater than that shown by the lowering of the tank as compared with the adjacent surface. Of course, there is a difference between a tank that is frequently filled and emptied, and one that is always full. Still it is somewhat remarkable to find that a considerable amount of settlement is always expected, as shown by the recommendation to connect the pipes carried through the wall of the tank with the pipe-line by a short piece of flexible hose; and to gauge the tank at several different points when estimating the contents, &c. The loading is not a great one, as 1 foot depth of petroleum would represent less than 56 lbs. per square foot; so that with a tank of the greatest depth mentioned—34 feet—the variation would be less than a ton per square foot. This is not a great weight to provide for; and so it would seem to be much the better plan to have a firm, unyielding foundation in the first place. This is especially seen when we remember that the value of a large tank full may be reckoned in thousands of pounds. And it seems absurd to take all sorts of precautions against loss by leakage, and at the same time leave the structure open to the strains caused by unequal settlement.

The author prefers wrought iron as the material, and the vertical cylinder as the form, for the tanks. The sheets are closely riveted—all perpendicular joints being double riveted; and the thickness of each tier of sheets is increased from the top downwards. A table giving full particulars of the thickness, &c., used in various tanks is included in the paper. It is considered better to increase the thickness of the bottom and lower sheets than to use stiffening framework. Large plates, 9 feet by 5 feet, are used, so as to reduce the number of rivet holes. The bottom is flat; and the roof may be domed like a gasholder roof in cold climates, but in warm places it is made flat, with a raised edge some 6 inches high, to enable a thin layer of water to be kept on. Sometimes a continual stream of water is supplied; the overflow passing down the sides, and thus preventing undue heating.

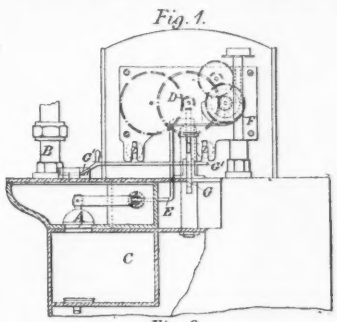
The oil is affected in bulk to the extent of 1 per cent for every 23° Fahr. Manholes are provided in the roof; and sometimes in the sides, near the bottom. Full particulars as to the methods of repairing and filling barrels, &c., are given.

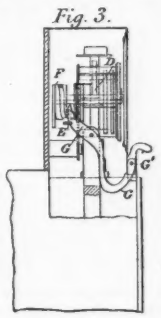
A long discussion followed the reading of the paper, in the course of which Mr. Boverton Redwood gave a great deal of useful information; Mr. S. H. Terry described some large tanks erected for the Mersey Docks and Harbour Board; and Mr. T. Urquhart contributed some interesting particulars as to the Russian petroleum industry.

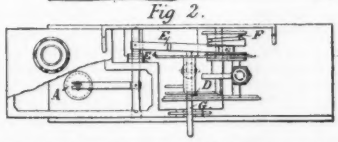
REGISTER OF PATENTS.

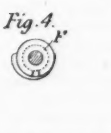
Prepayment Gas-Meters.—Cowan, W., of Edinburgh. No. 11,537; July 23, 1890. [1s. 3d.]

This invention is applicable to both wet and dry gas-meters; and it has for its object the provision of means for securing that, when a given quantity of gas has passed through the meter, the supply will be either shut off or so reduced that an application to the gas authorities for a further supply will become necessary. The invention also provides means whereby the intervention of the gas authorities for this purpose may be dispensed with, by enabling the consumer himself to obtain a supply of gas (and, from time to time, such further supplies as required) on depositing in the money-box of the meter one or more coins equal in value to the supply of gas he thus pays for.









When the invention is applied to a wet meter (see figs. 1 to 4), a supplementary valve A is added. It is so placed, as regards the inlet B, that all gas entering must pass through it before reaching the ordinary valve-box C. If, therefore, the supplementary valve be open, a supply of gas will pass into the ordinary valve-box, and thence into the meter; but if the supplementary valve be closed, the ordinary valve will receive no gas till the supplementary one has been opened. Whether the latter be closed or open depends on the index D, which controls a lever E that operates the supplementary valve by means of a worm F (or in some cases a cam), carried on, or geared into, the projecting axis of one or other of the index-wheels. The axis of the lever, which is near the centre, works on a fulcrum; and one end of it has a supplementary valve-cover fixed to it, while the other end is in contact with the worm or cam on the index-wheel axis above referred to. The lever is constructed in two parts, connected together by a cross-shaft of suitable length, and at right angles to the two arms. One of the arms of the lever, and about half the connecting cross-shaft, are within the supplementary valve-box; while the other arm, and the remainder of the cross-shaft, are outside of it. The cross-shaft thus passes through an opening in the side of the supplementary valve-box, and is free to move therein gas-tight.

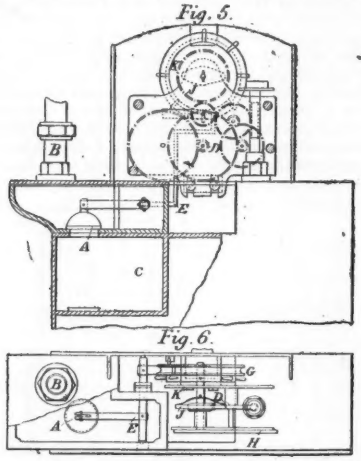
When the supplementary valve is open, a projecting portion of that end of the lever which is outside the valve-box lies upon, or bears

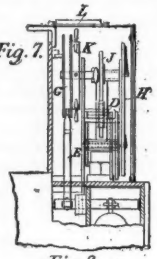
into, the groove of the worm or cam which is operated by the index; but when the valve is closed, the lever lies upon the roller end of the worm (or if a cam be employed, falls into a hole or catch provided for the purpose), which, being of smaller diameter than the worm groove, allows the valve to close, and keeps it closed till external interference has replaced the lever in the groove of the worm (or in the proper part of the cam), and, by doing so, opens the valve. The worm (see fig. 4) is so constructed that, when a certain point in its revolution has been reached, the part of the lever that bears on it escapes from the groove, and rests on the smaller diameter of the roller. The valve is thus closed by the mere action of the index; but as no force is employed, no obstruction is offered to the progress of the index in the event of the valve being either intentionally or accidentally leaky.

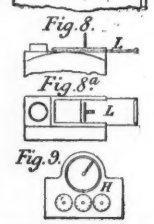
To enable the end of the valve-lever to be transferred from the roller back into the groove of the worm, that end of the lever is made capable of moving laterally from the point where it joins the cross-shaft. The transfer of the lever from the roller to the groove is effected from the outside of the meter by means of another lever G, one end of which is accessible from the outside, on the removal of a sealed catch or cover G1; while the other end is inside the index-box, and in the necessary position for operating upon the valve-lever when the latter has to be moved off the roller, over the thread of the worm, into the groove, and the valve thereby re-opened.

In applying the invention to dry meters, a supplementary valve, similar to that already described, is interposed between the inlet and the ordinary dry meter valve-chamber; and for the same purpose as described in connection with the wet meter. The supplementary valve-box and its appendages may be placed in any convenient part of the unoccupied space outside of the ordinary valve-chamber in the upper part of the meter. The supplementary valve-box receives all the gas from the inlet, and allows it to enter the ordinary valve-chamber of the meter only when the supplementary valve is open.

The foregoing arrangement provides for the shutting off of the gas only when one certain quantity has been passed—say, for example, 1000 cubic feet. In this case the worm (or cam) may be conveniently carried by, or geared directly to, the axis of the pointer which indicates 1000 feet on the ordinary index-dial. One advantage of such an arrangement is that it avoids the necessity for making any other addition to the index than the worm or cam; but there might, in certain cases, says the patentee, be a disadvantage in an arrangement admitting of only one particular quantity of gas being dealt with, and no other. To meet this difficulty, the following modification of the index arrangement becomes necessary when varying quantities have to be provided for: The index-dial H (see figs. 5 to 9) is provided with a special prepay-







ment circle, the maximum registration of which may be any convenient quantity. This circle is divided into small quantities—say of 100 cubic feet each. The pointer which indicates upon this circle is driven by the ordinary index-train D; but the gearing is so arranged that this prepayment pointer may be set for any prepaid quantity of gas without in any way disturbing the index and its registration. The prepayment pointer shaft carries a grooved pulley G (or cam), which has a hole in the groove, into which the end of the lever—bent upwards for the purpose—passes, and so allows the valve to close when the pointer returns to the zero position. The same shaft likewise carries the gearing-wheel J, by which the index drives it; but this wheel is only kept tight on the shaft by means of a spring fixed on the shaft, which spring presses upon the wheel. This gives to the wheel sufficient "grip" to enable it to turn the shaft when the index moves; but it leaves the shaft free to be itself turned, independently of the gearing-wheel and the index, when the pointer has to be set. The pointer is set by means of spokes K fixed to the circumference of the grooved pulley or cam, and accessible to the fingers on the removal of a sealed cover L on the top of the index-box.

For the purpose of enabling a consumer to obtain a supply of gas through a wet meter by merely depositing a coin, the following apparatus is used in connection with the index: On the shaft which carries the pointer of the special dial, there is mounted a wheel having a deep groove in its periphery, and another close behind it provided with teeth, into which a ratchet or pawl may fall. One end of the lever attached to the supplementary valve bears against the bottom of the groove of the wheel before mentioned; and as long as it remains so, the valve is kept open. But on the wheel attaining a certain position, the extreme end of the lever enters a hole in the bottom of the groove, when the valve will fall and shut off the supply of gas. Behind the wheel, and at 1 or 2 inches from it, is the back of the coin-box; and at the top of the index-case, there is a slit to receive the coin. This slit communicates with a curved shoot that causes the coin to fall between two moveable bars, one of which is placed vertically, and the other horizontally; the coin being supported on its edge by the curved foot of the horizontal bar. This bar is curved; works through a guide; and is pivoted vertically to another horizontal bar—the "pushing-bar." This also works through guides; and at its outer extremity (which extends to, and projects beyond, the outside of the case) it is furnished with a disc or knob. To the back of the coin-box, one end of a curved spring is fastened; the other end pressing against a stud fixed to the side of the pushing-bar. Thus upon pressing the disc or knob, the pushing-bar is made to advance; but upon being released, the spring causes the pushing-bar to resume its former position. To the front of the pushing-bar a pawl is pivotted (one end being weighted, while the other is capable of falling between the teeth of a stationary horizontal rack), having two projecting studs. The pivot upon which the pawl is hung also supports a mercurial tumbler, which has the effect of keeping the pawl free from the teeth of the rack until the proper time arrives for it to fall. This vertical "pawl bar" has, at its lower end, a horizontal bar working through guides fixed to the back of the case. The upper end has also a short horizontal bar fixed to it; and to this bar is pivoted a heavy pawl that falls between the teeth of the wheel mounted upon the arbor first mentioned. Attached to the back of the case there is a spring that presses against one end of the horizontal bar, so as to cause the bar to resume its normal position after being made to advance by the pushing-bar through the intervention of the coin.

In order to meet the possibility of a change in the price of gas, an arm is pivoted upon the arbor carrying the wheels; and the end of this arm is fashioned into the segment of a circle that rises slightly above the toothed wheel, and supports the lower edge of the pawl. The arm has pivoted to it a lever capable of adjustment by a pointer and graduated scale, mounted in an enclosure on the outside of the case, accessible to the gas official only. This determines the extent to which the tooth wheel can revolve on actuating the pushing-bar, and, by so doing, limit the flow of gas to the quantity corresponding with the value of the coin inserted.

The action of the apparatus is as follows: Into the slit a coin is placed, which falls down the shoot until it rests between the horizontal and vertical bars. The disc or knob is then pushed home, when (through the intervention of the coin) motion will be conveyed to the pawl-bar, which, by the action of the pawl, will cause the toothed wheel to move forward a predetermined number of teeth—corresponding with the quantity of gas of the value of the coin. As soon as the disc or knob is released from pressure, the coin will fall into the receptacle below; and a supply will take place only until gas of the value of the coin has been consumed.

Gas Heating and Cooking Apparatus.—Greenwood, E. P., of Manchester. No. 11,762; July 28, 1890. [8d.]

The claims made for this invention are: In a gas cooking-oven, the employment of a deflector tin or baffle-plate, with a hole or holes near the centre to fit the oven at any height, in combination with shelf-rests standing away from the oven sides. 2. The use of a vertical pipe or passage with heating burner and elbows or branches for distributing the heat. 3. The arrangement of discs, tubular stays, water-supplying basin, central tube, and outlet-tap, all constituting an improved water-heater. 4. An angular construction of fire-brick back for a gas-stove fire with zig-zag projections, gratings, and air-heating tubes and chamber.

Automatic Gas-Supplying Apparatus.—Hawkyard, J., and Braddock, J., of Oldham. No. 14,655; Sept. 17, 1890. [8d.]

This invention relates to improvements upon the automatic apparatus described in patent No. 12,584 of 1890, to which reference will be necessary (see JOURNAL for July 21 last) in order to follow the present invention.

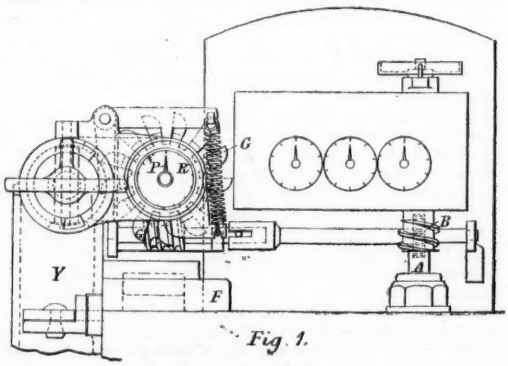


Fig. 1.

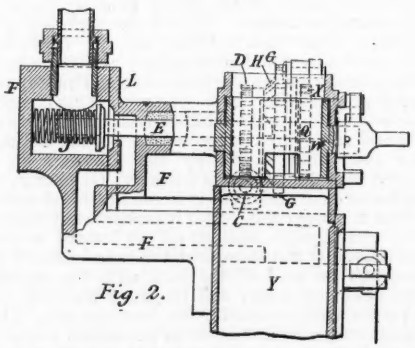


Fig. 2.

Fig. 1 is a front elevation of the upper part of a wet gas-meter

showing the improvements; and fig. 2 is a longitudinal section of the apparatus.

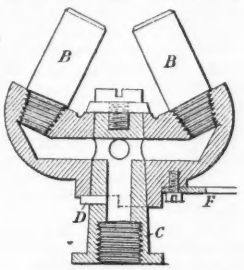
In the first place, the first motion wheel D is driven by means of a worm C, instead of a long pinion; the endwise motion of the short shaft or spindle E being so slight that the teeth of the first motion wheel will always remain in contact with the worm. The endwise motion may be given to E either by the spring J acting against it directly as shown, or by a spring acting against the first motion wheel, or else by means of a lever or weight.

Secondly, the supply-valve L is fixed to, or formed directly upon, the end of the short shaft or spindle E; the seating and passages being cast in the frame F of the apparatus, as shown at fig. 2. The first motion wheel D drives the pointer P, which is fixed on the end of the shaft or spindle E; and the rachet-wheel G actuates the dial-plate R, which is fixed to its boss.

Thirdly, the ram or pusher V is dispensed with, and the coin receiver is made in the shape of a cylindrical box, with a longitudinal slot (the size of the coin) above, and another corresponding slot beneath. Inside the box is a slotted coin receiver W, which is capable of being turned about half a revolution and back again; its motion being controlled by means of two stops. When a coin has been dropped through the upper slot into the coin receiver, the latter is turned partially round by means of a thumb-piece on the outside; and, in revolving, the coin acts against a tooth of the ratchet-wheel G (the teeth being in this case made deeper than before), so as to revolve the circular cam H. As soon as the coin receiver has made nearly half a revolution, the coin falls out through the lower slot into the receptacle Y beneath. On the side or boss of the ratchet-wheel is a stop-wheel Q, provided with a catch X on a lever, which is also raised by the coin, in revolving, coming against the tail-piece of the catch-lever, which is held down by a spring or weight, so as to prevent the wheel G from revolving unless released by the coin. The teeth of the ratchet-wheel G enter the coin-box through a slot made in the side of it; and the revolving coin receiver is made with a corresponding notch (see fig. 2), so that it does not act upon the teeth of the ratchet-wheel G unless it contains a coin.

Duplex Burners and Fittings.—Love, J., of Stratford, E. No. 15,409; Sept. 29, 1890. [8d.]

The main object of this invention is to provide for the adjustment of a duplex or other multiple gas-burner, so that it can be caused to furnish either a single flame or two or more flames as may be desired. Also that such burners may be so adjusted that the gas supply to one section or burner can be partially cut off, and the supply to the other burners completely cut off, so as to furnish merely a pilot light.



In the accompanying illustration of such a duplex gas-burner, A is the socket or body, having two short arms or branches to carry the burners B, preferably inclined towards each other. The main or central portion of the body or socket is bored out taper, and communicates with the holes in the arms through ports or ways. In this taper hole is fitted a correspondingly tapered plug C, having a central hole or recess and three ports or ways communicating therewith—two in line with each other, and the other one at right angles thereto. D is a pin or stop adapted to engage with a shoulder at either extremity of a slot or recess formed in the main portion of the body or socket. It is preferably so arranged relatively to the burner ports or ways that, when the body or socket is turned upon the plug in one direction, or so that the pin or stop is approximately in the centre of the slot or recess, gas will be supplied to both the burners; but when the body or socket is turned in a direction either to the right or left of this position (so as to bring the pin or stop against the shoulder or abutment at one or other extremity), gas will be supplied to only one burner. E is a short lever or handle fixed to the body or socket A, to facilitate the turning or adjustment thereof.

Gas Heating Apparatus.—Shaw, G. A., of Stockport. No. 897; Jan. 17, 1891. [4d.]

The object of this invention is to obtain different degrees of heat, concentrated or diffused, from a portable gas-stove. To this end, the patentee proposes to employ any suitable ring-burner portable gas-stove, raised on feet, and having radiating rests to support vessels a regulated height above the level of the flames; there being the ordinary opening underneath the inlet end of the tubular handle of the stove for the admission of air, which commingles with the gas as it passes along the tube to the perforated ring or gauze burner, whence it issues for combustion. Combined with this is a vertical Bunsen burner, which, by preference, occupies a central position in the ring-burner, but has no connection whatever with it in their respective gas ways. They are entirely separate, and may be either cast with, or fitted alongside the tubular handle of the stove. Although a separate gas-supply pipe may be adapted respectively to each section of the apparatus, the inventor remarks that he prefers to feed both parts by means of one supply-pipe, and to use a three-way tap, whereby either the vertical Bunsen burner may be used by itself, or the ring-burner may separately be in use, or both be combined at the same time; and the communication may be closed or regulated either from the Bunsen burner or the ring-burner, separately or wholly, when neither is needed.

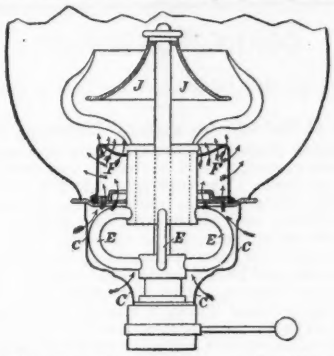
Water-Tight and Fire-Proof Pipes, Roofings, Walls, and Linings.—Kraus, P., of Vienna. No 8414; May 15, 1891. [8d.]

This invention relates to a process for constructing water-tight pipes of large diameter, suitable for conduits and similar works, and applicable also for roofings, walls, and linings, which, as well as the pipes, may, when required, be fire-proof.

In constructing pipes according to this invention, a number of I or T girders are set in a circle on an annular frame having the diameter of the pipe; and they are fastened together by hoops or bands arranged outside and inside the girders at suitable intervals—the whole being secured by bolting, rivetting, or coiling over with wire ropes. The cavities between the girders are then filled in with suitable material, which, on hardening, makes the pipe air and water tight and increases its strength. In the same way, fire-proof and water-tight walls and linings for buildings, ships, &c., as well as roofings, can be constructed; the girders being arranged to form plane or curved surfaces of any required form. The inner and outer rings, which serve to connect together the I or T irons, and also to form in the pipes points of great strength, may be arranged in various ways according to the purpose for which the structure is intended.

Gas-Lamps.—Brown, A. O., of Glasgow. No. 9174; June 1, 1891. [6d.]

This invention relates to gas-lamps having an Argand burner or one of similar construction. The object is to provide means of converting the flame (which is usually cylindrical in form or more or less inclined to be red in colour) into a tulip-shaped flame "of such brilliancy as to resemble the light of an electric incandescent lamp." This it is proposed to accomplish by placing at a suitable distance above the burner a deflector or spreader of hollow conical form, with a bell-mouth opening, carried on the top of a stem or spindle screwed into a gas chamber near the ramification of the branch tubes carrying the gas to the burner.



In the illustration, C are the air passages, and E the branch tubes. F is the hot air or regenerative chamber, with perforations cut around its sides. There are also perforations made in the roof, which is preferably of the shape shown. The central air passage of the gas-burner is indicated by dotted lines. J is the deflector or spreader; the flame produced by it being as shown. There is no speciality in the globe, the coronet supporting the opal canopy or dome, or the chimney for carrying off the products of combustion.

Governors and Valve-Movement for Gas-Engines.—Bosshardt, F.; communicated from F. A. Huntington, of New York. No. 9268; June 2, 1891. [8d.]

This invention relates to gas-engines of that class in which the operation of the inlet and exhaust valves of the cylinder is controlled by the crank-shaft through valve-stems extending to the shaft. It relates more especially to the valve-lifting mechanism, and to an improved governor for regulating the inlet-valve according to the speed of the engine.

In the best type of gas-engines as now used (says the patentee), the valves are opened only once for two complete revolutions of the crank or stroke of the piston. Were they opened at every stroke, it would be a simple matter to provide direct-acting cams on the crank-shaft, so arranged as to lift the inlet and exhaust stems at proper intervals. In order that alternate revolutions of the operating eccentric should have no effect upon the valves, there has hitherto been required very complicated and expensive mechanism, the practical operation of which has been far from satisfactory. The object of the present invention, therefore, is to provide valve-moving devices actuated from one end by the crank-shaft, which, without multiplication of parts, will operate these valves at alternate strokes, and which, from the simplicity of its construction, and the consequent strength of the parts, will need practically no repairs.

The valve-moving device consists of a casing provided on the side of the engine-frame, through which the crank-shaft passes. The valve-stems enter this casing, and are struck and lifted by teeth which form a spur gearing upon a rotating ring. The movement of this ring, by which it raises the valve-stems, is imparted to it by an eccentric keyed upon the crank-shaft, and loosely enclosed by the ring. The ring is differentially geared to an internal gear upon the inside of the casing; the ratio of teeth on the ring and casing being, for example, as 6 : 13. Consequently, the rotation of the eccentric and the successive engagement of the teeth of the ring with those of the casing gives a slow rotation to the ring in the direction opposite to that of the eccentric; the movement of the ring being a distance of one tooth space on the casing at each complete rotation of the eccentric. This rotation of the ring causes it to alternately miss and strike the valve-stems at each revolution of the eccentric.

Gas-Burners.—Attewell, T., of Nottingham, Clayton, H., of Beeston, and Selby, E., of Nottingham. No. 9968; June 12, 1891. [6d.]

This "improvement" in gas-burners consists in the tapering shape of the lower or entrance end and the smallness of the aperture through

which the gas passes from the feed-pipe into the burner; "this entrance aperture being so regulated and graduated in size as to agree in capacity with the exit aperture or apertures at the flame end of the burner." The "invention," say the patentees, is limited to these points, and is one that can be used in conjunction with any existing patent gas-burner, by causing the latter to assume the shape and structure at its lower end particularly specified. Immediately below the worm by means of which the burner is screwed into the feed-pipe or elbow, the burner tapers away to a comparative point; and at this point the entrance aperture is pierced—an aperture agreeing in capacity with the aperture or apertures at the flame end of the burner.

APPLICATIONS FOR LETTERS PATENT.

14,241.—JOHNSON, A., and the CO-OPERATIVE INVENTIVE ASSOCIATION, LTD., "Improvements in the method of lubricating gas or water valves with internal screws." Aug. 24.

14,269.—HUELSER, C., "Improvements in gas and petroleum motors." A communication from Messrs. I. M. Grob and Co. Aug. 24.

14,440.—ARROL, W., and FOULIS, W., "Improvements in apparatus for charging gas and other retorts, and in part applicable for other purposes." Aug. 26.

14,457.—WALLER, G., "An improved apparatus for exhausting gas." Aug. 27.

14,465.—TURNER, C., and KIRK, T., "Improvements in valves or cocks for the flow of gas." Aug. 27.

14,519.—ABEL, C. D., "Improvements in igniting apparatus for gas and oil motor engines." A communication from the Gas-Motoren-Fabrik Deutz. Aug. 27.

14,640.—INTZE, O., "Improvements relating to gasholders." Aug. 29.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Use of Tar and Ammoniacal Liquor as Manure.

SIR,—Some thirty years ago, when tar was of no value, I dug holes in a piece of spare ground, poured in the tar, and filled in; then dug others, and did the same. The next year I had the ground dug, and planted the whole piece with potatoes. At the digging time it was found that immediately over the tar the seed potatoes were as sound as ever—not even sprouted out; but at the edges of the holes we had the largest potatoes I ever saw. I showed some of them to a gentleman's gardener, who said he had never seen anything like them—they must be of foreign growth. The crop must have been fiftyfold. With regard to ammoniacal liquor, I know a steward who uses it for grass land just as it is—takes it in a water-cart, and puts it on the ground in wet weather, while it rains. Your correspondent Mr. Berry may, I believe, with a little practice, use both tar and liquor. If he will write to me, I will give him the steward's address.

A. THOMAS.

Cowes, Sept. 2, 1891.

Reduction in the Price of Gas at Heckmondwike.—The Directors of the Heckmondwike Gas Company have decided to reduce the price of gas, as from July 1 last, from 4s. to 3s. 10d. per 1000 cubic feet for consumers under 80,000 cubic feet per half year, and from 3s. 8d. to 3s. 6d. per 1000 feet to consumers of more than 80,000 feet, or, less discount, to 3s. and 2s. 8d. respectively.

Mr. Pete Curran on the Manchester Gas Strike.—Mr. Pete Curran, one of the Organizing Agents of the Gas Workers' Union, has been very busy with his meetings in the Manchester district, which were referred to in a paragraph in the JOURNAL last week. He has already visited Rochdale, Bury, Wigan, and Darwen, with (a Manchester paper says) "good results." On Sunday morning of last week, he held a meeting at Ancoats; and in his opening remarks, he claimed for the Gas Workers' Union that it was the largest society of unskilled workmen in the United Kingdom. Especially in Ireland they had made rapid progress during the last few months; for whereas six months ago there was only one branch in the north of Ireland, now there were eight. During the remarkable strike that took place at the Manchester Corporation Gas-Works, the Union received a blow that might have paralyzed a much stronger body. That dispute was the outcome of injudicious tactics on the part of local officials—men who, though they did not mean evil to their fellows, were practically infants in the labour movement, and did not understand the results of industrial warfare. Undoubtedly the dispute had brought a certain stigma npon the Union; and men who had to make sacrifices as the result of it did not in their indignation study the methods of the strike, or consider whose fault it was, but threw all the blame upon the organization generally. To the men who made it a pretext for leaving the Union, he would say that! they were not a very old organization, and when the Manchester strike occurred, had only been twelve months in existence. A child must learn to creep before it could walk; the Union had profited by the experience of the strike, and would be more judicious in its future tactics. That dispute was one in which their defeat was more absolute than any in which they had been engaged; but he would remind the present non-union gas workers that when the winter came on, and the superintendents could control them by the aid of the unemployed in the streets outside, they would discover the advantages of organization. By the combination of private interests with the Corporation, they had been beaten, but that did not justify these men in standing aloof from the organization which had materially benefited their own class throughout the country. He expressed the hope that he would be able to have some conversation with the present employees at the gas-works, and warned them that, if they left Manchester, "they would not be able to get employment at the other large gas-works in the country without the production of the Union card." Mr. P. Connor also addressed the meeting.

LEGAL INTELLIGENCE.

WEST HAM POLICE COURT—Monday, Aug. 31.

(*Before Mr.* E. BAGGALLAY.)

A Claim for Unpaid Water-Rates—A Question of Empty Houses.

Mr. *C. Leach*, of No. 16, Woodford Road, Forest Gate, the owner of 16 houses in Chestnut Avenue, and two in Woodford Road, was summoned by the East London Water Company for the non-payment of £12 18s., being the water-rates for four quarters to Midsummer last.

Mr. G. KEBBELL appeared for the Company; Mr. H. KEBLE represented the defendant.

Mr. KEBBELL explained that this was a summons against the owner of the houses in question, with the exception of one—No. 16, Woodford Road. In this the defendant lived; and he was liable for it as occupier. The reason the summons came before that Court was that they could not go to the County Court because a dispute had been raised by the defendant as to the annual value of the houses; and where there was a dispute, a Company could not sue, but must first of all have it settled under section 68 of the Water-Works Clauses Act, 1847. In the case of No. 18, Woodford Road, the defendant would not have been liable as owner, for the reason that it was over the annual value of £20; but he had made himself liable for it by requiring the supply of water, and agreeing to pay for it. Mr. Forrest Fulton's Act, which took away from water companies their power to cut off the supply where the owner was liable by law or by agreement, specified that a company should be at liberty to recover the rate from the owner or occupier. Section 74 was the one under which the summons was taken out; and it was applied for in order that the dispute as to the annual value should be settled, and then to recover on whatever was the amount decided. He should prove that the value the Company had put upon these houses was within a few shillings of that which the Overseers had fixed for the purpose of the poor-rates. In the Metropolis, under Torrens's Act, the rate-book was the arbitrary standard; but outside the Metropolis, it was necessary to prove the annual value in the same way as it was proved in the Dobbs case.

Mr. *T. L. Grace*, one of the Company's collectors, having proved that the amount of the arrears was £12 18s., stated, in cross-examination, that the defendant had applied to him to make a reduction of 50 per cent. for empties—the same as the former collector had done; but he had declined to do so, though, after a time, he offered to make a deduction of £3 4s. 6d. This the defendant would not accept.

Mr. KEBLE said he did not dispute the annual value, but contended that there ought to be a greater reduction for empties. In the past, the collector had been in the habit of making an allowance; and his client asked the new collector to do the same—informing him that no less than 12 out of the 27 houses were unoccupied, and had been so for twelve months. The account in the first instance was £13 3s.; but on the second occasion, the Company came down to £12 18s., and from this they had since offered to take £3 4s. 6d. for empties.

Mr. KEBBELL said the Company had always been ready to entertain the defendant's claim for empties.

Mr. BAGGALLAY: The question is, What have the collectors done?

Mr. KEBBELL submitted that defendant should have given them notice at the time, so that they might have investigated his claim.

Mr. BAGGALLAY: The old collector took off 50 per cent.; but the new one would not allow it.

Mr. KEBLE urged that, as his client had had a large number of houses empty, he ought to have a considerable reduction. Twelve of the houses had been empty for twelve months.

Mr. BAGGALLAY said that since the defendant did not dispute the annual value, the sole question to be decided was whether he ought not to be allowed a larger sum for empties. Defendant was entitled to plead that, as he had usually been allowed 50 per cent., the Company ought not to have "come down upon him" so sharply for not giving notice.

Mr. KEBBELL said he was not sure that defendant was entitled to any reduction for empty houses. A farmer who allowed his fields to lie fallow did not escape taxation. However, he was ready to meet defendant, if he would prove that the houses were empty.

Mr. BAGGALLAY thought the defendant should give some reasonable evidence.

Defendant said he had with him the receipts for the poor-rates, which would show what allowance had been made for empty houses. He could bring the books in half an hour.

Mr. BAGGALLAY said they would be of no use, for he might have deceived the poor-rate collector.

The proceedings were then adjourned for a time, in order that the parties might come to some arrangement. On the case being resumed, Mr. Leach having procured his books,

Mr. KEBBELL, after examining them, said he found that some of the houses which Mr. Leach alluded to as empty had been occupied; and he suggested that defendant had grossly deceived the parish authorities, and that the matter ought to be brought under their notice.

Mr. BAGGALLAY: It shall be. I make an order for the payment of the full amount, and the costs of the Solicitor and two witnesses.

Mr. KEBLE submitted that something ought to be allowed in respect of empties, if only for the £3 4s. 6d.

Mr. BAGGALLAY: You had a good opportunity to get that. You chose to go on with the case, and now you have got the judgment.

Mr. KEBLE intimated that he would appeal.

The Salford Gas Frauds.—Replying to a question put by Mr. Rycroft, at the meeting of the Salford Borough Council last Wednesday, as to whether he could give the names of those persons who had contributed to the £10,000 Hunter guarantee, the Town Clerk said that he had made application in this matter to Mr. Hunter's Solicitors without success. He hoped, however, that the Committee would again meet shortly; and that, in the course of a few weeks, they would be able to report further progress. Any information which came to hand in the meantime he would report. On this statement, the subject was not proceeded with

MISCELLANEOUS NEWS.

THE GAS AND WATER ORDERS OF THE PAST SESSION.

The report of the Board of Trade on their proceedings under the Gas and Water Works Facilities Act, 1870, during the past session, has just been issued. It states as follows:—

In December, 1890, fourteen applications for Provisional Orders under the Gas and Water Facilities Act, 1870, were made to the Board of Trade. Power was sought in these Orders to raise £208,400 by shares and £50,850 by loan. Of this amount £104,000 of share and £26,000 of loan capital related to gas undertakings; £79,400 of share and £18,600 of loan capital, to water undertakings; and £25,000 of share and £6250 of loan capital, to a combined gas and water undertaking.

The following is a list of the applications: Gas Orders—Cirencester, Godstone District, Matlock and District, Southborough, Staines and Egham, Woking District. Water Orders—Cirencester, Corsham, Matlock, North Sussex, Seaton and Beer, South-east Essex, Swaffham. Gas and Water Order—Bramley District.

Three of the six applications for Gas Orders were in respect of undertakings already existing without parliamentary authority, and they sought for such power to maintain and continue the existing works, and the manufacture and supply of gas—viz., Cirencester, Matlock and District, and Southborough. The Woking District and Godstone District Orders proposed to authorize new undertakings, and sought for power to construct gas-works, and to make and supply gas. The Staines and Egham Order related to an undertaking already possessing parliamentary powers, and sought to extend the authorized limits of supply. Objections were lodged against the various Orders; but it was not found necessary to hold any local inquiry. The objections were duly considered; and, as the result, various modifications and amendments were made.

The sliding scale of price and dividend was adopted in the Cirencester, Matlock and District, and Southborough Orders; the initial price per 1000 cubic feet of gas being fixed as follows: Cirencester, 4s. 3d.; Matlock and District, 4s. 3d.; Southborough, 4s. 8d.

In the Godson District and Woking District Orders, which proposed to create new undertakings, a maximum price to be charged for gas was authorized. The price fixed in each case was 5s. per 1000 cubic feet; power being reserved to the Board of Trade, after the expiration of three years, to vary the maximum price or to substitute a sliding scale of price and dividend. In the Cirencester Order, the undertakers were empowered to capitalize £5000 in respect of money already expended out of profits upon the improvement of the undertaking; the maximum dividend on this amount being fixed at 5 per cent. In the Godstone District Order, a special clause was inserted by agreement to meet the objections of the Highway Board to the effect that the gas-mains should be laid at a depth of not less than 2 feet from the surface of the roadway.

The supply of gas in bulk beyond the limits of supply, subject to certain limitations, was authorized in the Matlock and District and Southborough Orders. In the Southborough Order, it was found necessary to empower the undertakers to lay certain mains within the limits of the Tunbridge Wells Gas Company; but it was enacted that this power should not carry with it the right to sell gas. The limits of supply in the Godstone District and Woking District Orders embraced a portion of the authorized limits of two Companies already possessing parliamentary authority to supply gas; but these Companies (the Redhill Gas Company and the Woking Water and Gas Company) consented to the grant of a Provisional Order.

The Orders contain the usual clauses as to the sale of additional capital by auction or tender, limits of dividend, the creation of insurance and reserve funds, illuminating power, the testing of gas, the quantity of land to be taken by agreement, &c. Where necessary, the Gas-Works Clauses Acts, 1847 and 1871, have been incorporated.

Of the seven applications for Water Orders, five related to undertakings already existing, and two to proposed new undertakings. Of the five applications, three (Cirencester, Swaffham, and Seaton and Beer) sought authority to maintain and continue the present works, and to supply water—the Seaton and Beer Order also proposing to construct new works; and two (Matlock and Corsham) sought authority to raise further capital in respect of undertakings already sanctioned by Parliament. The North Sussex and South-east Essex Orders sought for power to construct new water-works and to supply water. Objections were lodged against many of the Orders; but, with certain modifications and amendments, the Board of Trade decided to grant all the applications.

In the case of the South-east Essex Order, it was proposed to hold a local inquiry; but the promoters decided to confine the limits of supply to the districts in respect of which they had obtained the consents of the local and road authorities. An inquiry was consequently not needed; but the title of the Order was changed to the Rochford, Rayleigh, and Leigh Water Order, to meet the altered circumstances. In the Orders containing power to charge rates for the supply of water for domestic purposes, the rateable value of the houses, as ascertained by the valuation list in force, was fixed as the basis on which such rates should be levied. In no case were the undertakers exempted from giving a constant service of water.

The limits of supply in the Rochford, Rayleigh, and Leigh Order included a portion of authorized limits of the Southend Water Company; but that Company not having excercised their powers, and having agreed to the transfer of the district to the promoters, a clause to carry out this object was inserted in the Confirmation Bill. In the Cirencester, North Sussex, Rochford, and Seaton and Beer Orders, it was enacted that if, after the expiration of six years, the undertakers were not furnishing a sufficient supply of water within any portion of their authorized limits, the local authority having jurisdiction might provide a supply in accordance with the provisions of the Public Health Act, 1875, or any company, body, or person might apply for an Act of Parliament or Provisional Order for authority to supply water. In the Cirencester Order, power was reserved to the Board of Trade to alter the rates authorized by it at any time after the expiration of six years, upon the application of any local authority having jurisdiction within the limits of supply, or of twenty or more inhabitant householders. In the Cirencester, Swaffham, North Sussex, and Rochford Orders, the undertakers were authorized to sell water in bulk beyond the limits of supply, subject to certain limitations.

The undertakers in the North Sussex and Seaton and Beer Orders being individuals, a clause was inserted providing that no sale or assignment of the undertaking should have effect until approved by the Board of Trade. The latter Order contains a special clause, inserted as a condition of consent of the Axminster Highway Board, requiring the undertakers to pay the charges and expenses of their Surveyor in connection with the inspection and superintendence of roads broken up by the undertakers.

Where necessary, the Water-Works Clauses Acts, 1847 and 1863, were incorporated; and the usual clauses as to the sale of additional capital by auction or tender, regulations for preventing waste, misuse, or contamination of water, supply of water by measure, and the quantity of land to be taken by agreement, &c., were inserted.

One application was made to the Board of Trade for a combined Gas and Water Order; power being sought to construct gas and water works and to supply gas and water in Bramley and the surrounding district. Numerous objections to the application having been lodged by the Local Authorities and other parties interested, the Board of Trade appointed Major Marindin, R.E., C.M.G., to hold a local inquiry. That officer reported that, in his opinion, the Order should be refused, as he could not recommend that the consents of the numerous Local Authorities should be dispensed with. The Board of Trade accordingly declined to proceed with the Order.

Three Bills to confirm the Orders were introduced into the House of Lords—the two former on the 30th of April, and the latter on the 4th of May. The Southborough Gas Order was petitioned against by the Southborough Local Board; but clauses enabling the Local Board to purchase the undertaking were agreed upon. There was no further opposition to the Bills; and they received the Royal Assent on the 21st of July.

Annexed to the report is a table showing the number of Orders made by the Board of Trade since the passing of the Gas and Water Works Facilities Act in 1870. In the 21 years which have since elapsed, 373 Orders have been applied for, and 350 made by the Board, of which 346 have been confirmed by Parliament. The total amount of fees received with the applications has been £26,845.

NOTTINGHAM CORPORATION GAS AND WATER SUPPLY.

The Annual Reports.

At a Special Meeting of the Nottingham Town Council yesterday week—the MAYOR (Mr. S. H. Sands) presiding—the annual reports of the Gas and Water Committees, which were noticed in the last issue of the JOURNAL, were submitted.

Alderman BARBER moved the adoption of the report of the Gas Committee; remarking that he hoped it would be considered a satisfactory one. It would be observed that there had been a very large increase in the consumption of gas—38 million cubic feet more than had ever been sent out in the same period before. He was afraid that this large increase was not so much owing to a growth of business (inasmuch as there were really less meters out than in the previous year) as to the extremely severe winter through which they had passed. If the coming winter was less severe, the consumption would be materially decreased. The increase, therefore, had not led to any considerable addition to the profits, inasmuch as the severity of the winter had caused an enormous outlay in looking after the stoppages arising from deposits of naphthalene and from frozen meters. There had been as many as 400 applications a day from consumers requiring attention to their meters; and during last winter there had been altogether from 6000 to 7000 more applications of this kind than ever before. The additional cost incurred in this manner more than counterbalanced the profit accruing from the increased consumption. The extra amount of gas consumed, however, could be favourably looked upon from at least one point of view—that was, the increase caused by the growing number of gas-stoves in use in the town; and if the price of gas could be kept down, these appliances would probably continue to advance in public favour.

Alderman J. P. FORD seconded the motion; and it was agreed to.

Alderman GRIPPER then moved the adoption of the report of the Water Committee. In doing so, he remarked that the material increase in the expenditure of the Committee was due, as to a very large proportion, to the increased cost of coal—nearly £500 more than in the preceding year—and to the increase in the amount paid as rates and taxes. In this manner, £700 out of the £1300 increase was accounted for. It was satisfactory to notice that the machinery of the Committee was kept in a state of thorough efficiency; and, indeed, as to that at Papplewick and Basford, in an improving condition.

Mr. W. LEE seconded the resolution; and it was carried.

Sales of Shares and Annuities.—At Plymouth last Tuesday, 500 new shares of £10 each in the *Plymouth and Stonehouse Gas Company* were sold by public auction. There was a large attendance of buyers; and the competition for the shares was keen. The whole of the 500 were disposed of at £20 2s. 6d. and £20 5s. each; and at these prices, if the present dividends are maintained, they will return to the purchasers 4½ per cent.——On the same day at Sheffield, £3575 of *Sheffield Corporation* 2¾ per cent. progressive water annuities were sold by auction. Of this amount, £500 sold at £105⅛ per cent., £500 at £105 per cent., £500 at £105⅜ per cent., £675 at £105 per cent., and £1400 at £104¾ per cent. ——At a sale of shares at Brighton last Thursday, five lots of £100 4 per cent. debenture bonds of the *Brighton Corporation Water-Works*, redeemable in 1889, sold at £105 to £106 10s. Five original ordinary shares of £20 each in the *Brighton and Hove Gas Company* realized £41 10s. per share; five "A" shares of £20 each fetched £32 10s. per share; and five 6 per cent. "B" preference shares of £20 each produced £30 10s. per share.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented to the shareholders of the above Company at their half-yearly meeting on Friday next, the Directors state that the result of the working in the six months ending June 30 last is a balance of £3647 to the credit of the revenue account. They explain that the decrease in the profit, as compared with the corresponding half of last year, is chiefly due to the excessive price of coal; in addition to which the increased wages still adversely affect the profits of the Company. The deficiency will be met by the balance brought forward, to which has been added the proceeds of the sale of the contingent fund; thus bringing up to £20,374 the amount available for division. The dividend amounts to £14,232; therefore the balance to be carried forward to the credit of the next half year will be £6142. Coke and other residuals show an improvement of £2510; and there was an increase of 12·87 per cent. in the quantity of gas sold during the half year, as compared with the corresponding period of 1890. This large advance partly arises from the past severe winter; but the general increase is shown by the June quarter, which gives 9·67 per cent. The Directors recommend the declaration of a dividend for the six months at the following rates per annum: 6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares—amounting to £14,232, less income-tax. The accounts annexed to the report show that the receipts for gas amounted to £52,907; those for meter and stove rental, to £1157; residuals realized £19,443; and the total receipts were £73,538. The chief items of expenditure were: Manufacture of gas (coals costing £42,011), £57,984; distribution, £4076; management, £3126—the total being £69,891. In the statements relating to the manufacturing operations of the Company in the past six months, it is shown that 46,515 tons of coal and cannel were carbonized; and that the quantity of gas produced was 460,634,000 cubic feet, of which 420,271,200 cubic feet were accounted for. The residual products were: Coke, 558,180 cwt.; breeze, 4157 yards; tar, 467,030 gallons; and ammoniacal liquor, 930,300 gallons, from which 327 tons of sulphate of ammonia were made. No fresh capital was raised in the six months; but there has been a call of £4 10s. per share on the new ordinary 7 per cent. shares, which will produce £18,315. A sum of £13,322 was spent, mainly for manufacturing and distributing plant. The total expenditure on capital account up to June 30 last was £364,822, out of £381,649 called up; leaving an unexpended balance of £16,827.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Annual Meeting of this Company was held last Saturday week, at Tottenham—Mr. GEORGE GRIPPER, J.P., in the chair.

The SECRETARY (Mr. J. Randall) read the notice convening the meeting; and the report and accounts for the past half year, which were summarized in the JOURNAL last week, were taken as read,

The CHAIRMAN, in moving the adoption of the Directors' report, said he thought they might say that day, as they had happily been able to do on many previous occasions, that the report was a favourable one. They had had, and were still under, difficulties with regard to the high price of coal; but in other respects they had gone on remarkably well. The increase in the gas sold, as compared with the corresponding period of 1890, had been 9·33 per cent.; and this, although due to some extent to the severe weather from January to March, was owing chiefly to the larger number of gas-stoves now in use, and which they found were still constantly increasing. Up to the end of June, they had 188 stoves in excess of the number in use at Midsummer, 1890. The increase of 9·33 per cent. in the gas sold was large; but when they came to the profit and loss account, they saw that the extra price of coal had completely swamped what they had gained by the additional consumption. They had fortunately received higher prices for the residuals. Coke, breeze, and tar had had a very fair sale; but sulphate of ammonia, although they had sold a considerable quantity, had gone down in the market price. In the report it was stated that, in order to meet the views of the coal-owners, and to ensure the position of the Company during the winter, the Directors determined to give out the coal orders in nearly equal monthly quantities. Consequently they had a considerable stock of coal in hand; and this had been a very great saving. While they had a good quantity of raw material by them, they felt they would have no difficulty in maintaining the supply of gas owing to the railways being disorganized by severe weather; and at the present time they had nearly 6000 tons in store. The price of coal had been 3s. 2d. per ton above the average of the corresponding period of last year; and this meant a total additional cost of £2103. The shareholders would thus see that if the Company had only had to pay the same price for coal as in the early part of last year, they would have now been in as strong a position as then; and, in fact, rather better, because they were doing a larger business. Coke and the other residuals had to some extent made up the loss upon the price of coal. On coal they had spent an extra £2103; while coke had brought in an additional £560. Purification had also cost more; and the item of wear and tear was likewise in excess of what it was last year. A great deal of this was due to the replacing of the wooden girders in the coal-store with iron ones; and this had been charged to wear and tear, instead of capital. Then to facilitate the conveyance of coal, coke, and other materials, into and out of the works, they had laid down a larger number of rails in the yard; and in the future these would greatly decrease the cost of labour. There was another item charged to wear and tear which he should like to mention, although it was only a small sum. The people of Tottenham and Edmonton a short time ago arranged to hold an industrial exhibition; and the Directors felt that they could not let the exhibition take place without putting in an appearance. They therefore gave instructions to the Engineer (Mr. W. H. H. Broadberry) to have a stove and cookery room fitted up; and the expense of this they felt justified in charging to wear and tear. This was perhaps going beyond their province; but the exhibition had given an immense impetus to the use of gas-stoves. They engaged a lady to deliver lectures; and these were one of the most popular features of the exhibition, and resulted in a large number of stoves being let out. Though on this occasion they were trenching upon the undivided profits in order to pay the dividends, he did not think they need be in the least disheartened by doing so. They had now entered into contracts for coal which would bring down the cost by 2s. 3d. or 2s. 4d. per ton. If coal had continued to rise, the Directors would necessarily have had to increase the price of gas; but they felt to have done so would have been impolitic if they could by any means stave it off. They were now selling gas at a lower price than many other suburban companies; the price to the private consumers being 3s. 2d. per 1000 cubic feet and to the local authorities £3 2s. 6d. per lamp. By this price of £3 2s. 6d., they were giving the public at least £600 or £700 more, in the way of reduction, than the Enfield, Southgate, and other neighbouring Companies. Therefore, although, of course, there might be some feeling of disappointment that the Company were not earning their full dividend, the Directors were perfectly certain that the dividend was secure; and further, although they still had adverse circumstances to contend with—such as the high price of coal and labour—they felt quite sure that the former had now been at its maximum.

Mr. CORBET WOODALL said that, notwithstanding the story which the Chairman had had to tell as to the past half year, he seconded with pleasure the adoption of the report, including, as it did, the recommendation made by the Directors with perfect satisfaction and without any misgivings, that the ordinary dividends should be paid. During the half year, they had earned 6·6 per cent.; and they were proposing to pay 9·6 per cent.—having thus earned just about two-thirds of what they were dividing. The Chairman, however, had given the shareholders reason enough to justify the comfortable expectations of the Board that this was only a temporary and passing deficiency; and that next year they would be in the condition of having earned the dividend which would then be proposed. He was even more hopeful than the Chairman; for he believed, judging from the price at which the new contracts for coal had been placed, that they would earn the dividend which would be recommended in the next report. The past half year had indeed been an unusually trying one. The increase in the revenue from gas, as the Chairman had said, had been rather more than 9 per cent.; but on the other hand, the increase in the amount paid for coal had been 30 per cent., while the extra sum received for the residual products had only been equal to the actual additional consumption of coal—in other words, while they had paid this enormous increase per ton upon the cost of coal, they had obtained nothing as a set-off against it by the higher value of residuals. This showed that the old expectation which most men interested in the gas industry entertained that, if the price of coal went up, it would be met by an increase in the value of residuals had not been realized in Tottenham during the past half year. But it must be very satisfactory to the shareholders, as it was to the Directors, to know that they had been able to meet the special calls which had come upon the Company during the half year without having to increase the price of gas; and that they could stand another half year, and another after that, in waiting for the inevitable reduction that would come in the price of coal. The cost of wages, as the shareholders were aware, was much higher than a year ago; but that item had now, they hoped, settled down into a steady amount. In view of all these circumstances, he had great satisfaction in seconding the adoption of the report.

Mr. WATSON congratulated the Directors on the good report they were able to present, considering the very trying half year they had had to face. He also drew attention to the decreased yield of gas per ton of coal carbonized, and asked whether any explanation could be given in regard to it.

The ENGINEER (Mr. Broadberry) replied that one half of a year never came out exactly the same as the other. The quantity of gas sold per ton of coal carbonized in the second half of last year amounted to 10,195 cubic feet; and during the past six months to 9892 cubic feet—making the average for the year 10,048 cubic feet.

Mr. D. FORD GODDARD said he noticed that the Directors had carried to the capital account the sum of £1097 for gas-stoves. These were part of the plant of a gas company which did not last a long time, and upon which the wear and tear was very considerable; and he asked whether there were no means by which this amount of capital could be written down as the stoves depreciated. Otherwise he thought it would be better not to carry anything more to capital on account of plant which depreciated as gas-stoves did.

The CHAIRMAN said that with regard to Mr. Goddard's question, they wrote off 20 per cent. per annum for wear and tear on gas-stoves; but the amount would fluctuate from year to year, inasmuch as they wrote off 20 per cent. from the valuation of the previous year, and then added to it the outlay they made on new stoves. They estimated the average life of these stoves at five years. As to Mr. Watson's remarks, during the past half year, they sold 9892 cubic feet of gas per ton of coal, as compared with 9774 feet in the corresponding period of last year.

The motion was unanimously carried.

On the proposition of Mr. J. WARREN, seconded by Mr. GODDARD, dividends were declared, less income-tax, on the "A" stock at the rate of 11½ per cent. per annum, and on the "B" and "C" stock at the rate of 8½ per cent.

Mr. Woodall was then re-elected to his seat at the Board, on the motion of the CHAIRMAN, seconded by Mr. LANG; as was also Mr. Warren, on the proposition of Mr. WOODALL, seconded by Mr. LOW.

Mr. J. L. CHAPMAN next proposed, and Mr. ALFRED RICHARDS seconded, a resolution re-appointing Mr. A. H. Baynes as one of the Auditors; and it was agreed to.

Votes of thanks having been passed to the Directors and Auditors,

Mr. GODDARD moved, and Mr. R. P. KEYS seconded, a motion thanking the officers and staff for the services rendered by them during the half year.

Mr. RANDALL and Mr. BROADBERRY briefly responded; and the last-named gentleman, in the course of his observations, pointed out that the increased price the Company had had to pay for coal came out to nearly 4d. per 1000 cubic feet of gas sold. He also referred again to the remarks of Mr. Watson—stating that in the twelve months ending Midsummer, 1885, the quantity of gas sold was 9836 cubic feet; in

1886, 10,155 feet; in 1887, 10,235 feet; in 1888, 10,124 feet; in 1889, 10,143 feet; in 1890, 9997 feet; and during the past year, 10,048 feet. Except in one instance, during the whole of that time the unaccounted-for gas had been under 5 per cent.; and last year it was 4·88 per cent.

The proceedings then terminated.

BRISTOL GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday week—Mr. J. W. S. Dix in the chair.

The Secretary (Mr. James V. Green) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts, an epitome of which appeared in the Journal for the 25th ult.

The Chairman, in moving the adoption of the report and accounts, said he thought the shareholders would agree that they were of a very satisfactory character. It would be seen that coal still held a prominent position in the expenditure, and cost £10,000 more than in the previous half year. The accounts also showed increased expenditure under the head of purification. It was said some time ago that they did not produce gas of sufficient illuminating power. Formerly the standard was 13·5 candles; but now it was 14·5 candles, and they were giving above 16 candles. He thought the gas in Bristol would bear comparison with that of any other city, so far as purity was concerned; and when they were before the House of Commons Committee, it was a matter of satisfaction that not a single word of complaint was made by the Bristol Corporation against the purity of the gas. The accounts also showed increased expenditure in renewals and other things, and in extending the mains so as to meet further demands for gas. In the consumption, there had been an increase of about 9 per cent. The Directors would have liked, if they could, to have reduced the price; but the continued high cost of coal, and the good quality of gas supplied, rendered it difficult to make any substantial reduction. However, this matter was receiving the attention of the Board; and they would lower the price at the earliest opportunity. Notwithstanding the heavy expenditure on renewals and in other ways, he thought they had done better than other companies. Without drawing upon the reserve fund, as had been done at Liverpool, and without raising the price of gas, they were able to pay a dividend at the rate of 10 per cent., and carry forward a handsome balance. Their new Act gave them power to divide their stock, which at present bore nominally 10 per cent., into two £100 shares bearing 5 per cent.; so that people outside would not be able to keep on saying they were paying 10 per cent. The Bill also empowered them to double their reserve fund, to make it £102,000. It also increased the borrowing powers of the Company, and gave them power, if it should be desirable, to supply gas in bulk. In his opinion, the Bill was one in the interests of the consumer as well. It enabled the Company to borrow money on better terms than could be done by the issue of stock; and if they could procure money at a less percentage, in this way they would be able to supply the consumers with gas at a lower price than they could if they obtained the money at higher rates. With regard to the matter of leakage, every step was being taken to deal with this as effectually as possible. Other companies suffered in a similar way; and all he could say was that the best efforts of the Board were being directed to reducing it.

Mr. Medway seconded the motion, and said he felt great pleasure that the Company had been successful with their Bill; for it would put an end once for all to the misstatement that the shareholders were receiving 10 per cent. Some of them were only receiving 5 per cent., and many others not even that return, upon their money.

Mr. Gossett said he was one of the largest shareholders in the Company; but he had no fear as to the competition of the electric light, feeling certain the Company could well hold their own. He was afraid, however, that the Corporation might risk (say) £60,000 in plant; but the citizens would be very foolish if, with the experience of the unprofitable docks before them, they permitted another large sum of money to be devoted to unremunerative purposes.

Mr. Withers said he hoped that, by effecting economies, the Board would be able to reduce the price of gas. Of course he did not know the value of the services of the Directors; but many outside thought that £2000 was a large amount to divide among seven gentlemen.

After further discussion,

The Chairman replied. He remarked that the Company's new Act would enable them to increase their reserve fund considerably; and this would prove of advantage to the consumer, as it would enable the Directors to keep the price of gas at a more level rate than hitherto. Although the question of the Directors' remuneration was a personal one, he must say, seeing what the Board had accomplished for the shareholders, that even increased fees to those at present received could not be considered as too much. The price of the stock had risen from 191 to 206; and the division of stock about to take place would further increase the value.

The report was unanimously adopted, and the dividend recommended declared.

An extraordinary general meeting was then held, for the purpose of authorizing the Directors to create and issue under the new Act the unissued capital and debenture stock of the Company.

The Chairman explained that a large outlay was contemplated; and it was necessary to issue the stock in order to keep pace with the increased consumption of gas.

The resolution having been adopted, a hearty vote of thanks was accorded to the Chairman and Directors.

Extension of the Brussels Gas-Works.—According to the Brussels correspondent of *Industries*, the extensions which are about to carried out at the Laeken Gas-Works of the Brussels Municipality, to which reference has already been made in the Journal, comprise four gasholders, and additional condensers and purifiers. These will be erected, from the plans and under the supervision of M. Aerts, the Gas Engineer of the Municipality, on land which has been acquired at Schaerbak.

PROVINCIAL GAS AND WATER COMPANIES.

The following paragraphs contain the principal features of the financial statements and reports of the proceedings at meetings of the various Provincial Gas and Water Companies referred to.

Gas Companies.

The Directors of the Falmouth Gas Company, in their annual report, state that the concern continues to prosper; and, under the able management of Mr. J. W. Buckley, the result of the past year's working has proved satisfactory. Some of the purifiers having become defective, and additional purifying power being required (in consequence of the large increase in the quantity of gas now made), it has been decided to erect a new set of four large purifiers, to accommodate which an alteration in their position is necessary. The cost, with additions to buildings, will amount to about £1000, a considerable portion of which will have to be paid from revenue. The profit of the year amounted to £1919. An interim dividend at the rate of 10 per cent. per annum was paid in February last; and it is proposed to pay a final dividend at the same rate.

The annual general meeting of the Hartlepool Gas and Water Company was held last Friday week. The Chairman (Mr. W. H. Fisher, J.P.) congratulated the shareholders upon the steadily increasing consumption of gas and water. It was, he said, gratifying to be able to state that the make of gas exceeded that of last year by 15 million cubic feet, or an increase of 7 per cent. The decrease in the revenue was £978, due to the increased cost of coal. Last year, he had estimated this increase at £3500; but it had proved to be £3861, and were it not for an increase of £1106 in the sale of coke, and £450 in tar, and an improved revenue from water, the dividend about to be recommended could not have been realized. The quantity of coal carbonized was 24,534 tons, against 23,643 tons in 1890. The amount of gas produced per ton was 10,063 cubic feet; and the quantity sold, 9159 cubic feet. The number of cookers on hire was 453, against 383 in 1890, and 286 in 1889. The new coal contracts had been effected at a reduced price. Referring to the water undertaking, he said that, although the revenue had increased by £587, the profits had been reduced by the increased cost of coal and wages; but they hoped to be recouped by a steadily increasing consumption. The additional demand for gas had obviated the need for raising its price; and they proposed to pay this year's dividend free of income-tax, by carrying forward a floating balance of £486, against £1935 last year. He concluded by proposing a dividend at the rate of 7½ per cent. per annum on the "A" and "B" shares, and 7 per cent. per annum on the "C" and "D" shares; leaving £486 to be carried to the undivided balance.

The accounts of the Lewes Gas Company (which were submitted at a meeting of the shareholders last Wednesday) show that a profit has been made of £1434 on the working of the past half year. After providing for interest on mortgages, the balance of net revenue, as shown in the profit and loss account, is £1939. Out of this a dividend of 5 per cent. has been declared—amounting to £1310, and leaving a balance of £628 to be carried forward.

The annual general meeting of the Morecambe Gas Company was held on Monday of last week—Mr. M. Simpson in the chair. The Manager (Mr. W. Duff) having read the notice convening the meeting, the report and accounts, which were dealt with in the Journal a fortnight ago, were presented. The latter, as already mentioned, showed an available balance of £2663; and the Directors recommended a dividend of 5¼ per cent., making, with the interim dividend, 10 per cent. for the year. The Chairman, in moving the adoption of the report, congratulated the shareholders on the satisfactory result of the year's working. He said that there had been a large augmentation of revenue under every head, as compared with the previous twelve months. In private lighting there had been an increase of £432 in the receipts; in public lighting, £166; in cooking and heating, £80; in the rental of meters, £31; in residual products, £284; in the hire of gas-stoves, £12; and in fittings, £8—making a total increase in the revenue of £1013. But from this they had to deduct the large additional expenditure for coals, wages, &c., of £724, which left a net increase of profit of £289. This result, he was sure, would be satisfactory to the shareholders, and gratifying to the Manager. The new retorts mentioned in last year's report had been erected; but the demand for gas was so much on the increase that further extensions would have to be made without delay. The plant for the manufacture of sulphate of ammonia had been completed. The work had given satisfaction up to the present; and it would in the future add to the profits of the Company. The report was adopted, and the dividend recommended declared. A vote of thanks was accorded to the Chairman and Directors; a similar compliment being paid to the Manager. In acknowledging the vote as regarded himself, Mr. Duff said that in a few months it would be a quarter of a century since he took the management of the gas-works. He was pleased to be able to present so satisfactory a statement of accounts as that which had been submitted, which spoke for itself; and he was much obliged for the shareholders' renewed confidence in him.

In addressing the shareholders of the Richmond Gas Company at the recent half-yearly meeting, the Chairman (Mr. Carless) stated that during the past six months they had spent on capital account £4528, of which £3409 had been expended on the new gasholder, £721 in extending the retort-house, and £220 on gas-stoves. Turning to the revenue account, it was seen, he said, that there had been an increase in the cost of coal of £2629, as compared with the corresponding half of last year—nearly 1000 tons more having been used, together with an advance in price of 4s. per ton. The Directors did not, at all events at present, intend to raise the price of gas, as, he was happy to say, they were in a position to pay the dividends. The receipts from the sale of gas showed an increase of £2051, or 12 per cent., which was very large, and the stove-rental had increased by £26. The receipts for coke had been £684 more—a larger quantity having been sold, and better prices having been obtained. The result was that they were able to pay a full dividend, and to carry forward £1122, which, under the circumstances, he thought was very satisfactory. With reference to the extension of the carbonizing plant and the enlargement of the retort-house, he mentioned that the Company were now making 190 million

cubic feet of gas, against 64 million cubic feet when the retort-house was built, twenty years ago. After a short discussion, the report was adopted; and dividends of 5 per cent. on the "A" and "B" stocks and 3½ per cent. on the "C" stock were declared for the half year. Votes of thanks were passed to the Chairman and Directors, and also to the Engineer (Mr. T. May) and the Secretary (Mr. E. B. Blott).

The half-yearly meeting of the Rugby Gas Company was held last Friday week, when an interim dividend at the rate of 11 per cent. per annum was declared. The cost of manufacture during the six months was £3549; and 3415 tons of coal were carbonized. The sales of gas amounted to £4365, and the residuals realized £1088. The profit on the six months was £1475.

The annual meeting of the Sunderland Gas Company was held last Thursday. The Chairman (Mr. E. C. Robson), in moving the adoption of the annual report—which was referred to in the JOURNAL last week—said he had frequently complained of the excessive dulness and monotony which pervaded their annual meetings; for they had not varied for 22 years in the amount of dividend paid, except during an interval of eight years when there was a pleasing addition of 5s. premium which was paid by them to cover the deficiency of former years. There was, he might mention, a novelty in this year's report, as it was the first year since the 10 per cent. was paid that their earnings had fallen short of the dividend they were receiving; being this year £1712 short. During the year, there had been the large increase in the cost of coals of £10,889. This was partly due to the larger consumption of coal, but mainly to the rise in its value. In the autumn of last year, it was a very anxious time for the Directors; but they had come to the conclusion not to increase the price of gas, which ranged from 1s. 6d. to 1s. 11d. net. He thought they were quite justified in taking the action they did, as they were still enabled to pay the statutory dividend. They had recently made their bargains for coals for the coming twelve months at a reduction of something like 2s. per ton, which he trusted would enable them to tide over the coming year without making any addition to the price. There had also been another large increase in wages, which the shareholders would see had gone up £1791 in the year. The Directors had given in to the men on several points; and he believed they were now pretty contented. As to the consumption of gas, there had been an increase of about 8 per cent. Their Secretary (Mr. J. H. Cox) had handed him a statement of the quantity of gas consumed in the year 1882 as compared with the year 1891. In the former period the consumption was 390 million cubic feet, and in the latter 648 million feet; so that they would see it was not far off being doubled. With regard to electricity, he did not know to what extent they were endangered. But he knew that in many towns where the price of gas was double what it was in Sunderland, electricity was double that again; and out of the sixteen electric supply companies in London, he did not think there had been a penny dividend paid up to the present, and he was given to understand that upwards of £3,000,000 had been invested in this way. Mr. Stokoe seconded the motion, which was agreed to. A dividend of 5 per cent. was then declared on the original stock, and 4¼ per cent. on the additional capital stock for the half year. A vote of thanks to the Chairman and Directors terminated the proceedings.

As a result of their trading during the past twelve months, the Truro Gas Company have an available balance of £1161, out of which it is proposed to pay a dividend of 7½ per cent; being ½ per cent. increase upon the previous year.

At the half-yearly meeting of the West Kent Gas Company, held yesterday, the Directors submitted the audited statement of accounts for the six months ending June 30 last. It showed that the revenue from the sale of gas in that period was £6398; the returns from residual products were £1462; and the total receipts, £7929. The expenditure was £5380; so that there was a balance of £2549 carried to the profit and loss account. This account showed a sum of £5821 available for division. In the report accompanying the accounts (which was signed by the Secretary, Mr. R. Peake Keys), it was stated that, notwithstanding the fact that the past winter was a very trying one for gas companies, the cost of coals unusually high, and the labour market unsettled, the Directors were glad to be able to recommend the payment of the statutory dividends.

Water Companies.

The half-yearly meeting of the South Essex Water Company was held last Saturday week. In moving the adoption of the report, the Chairman (Mr. J. C. Amos) stated that the net profit for the past six months had been £3554. After providing for the interest upon the debenture stock, there remained £3417 to the credit of the half-year's working, which enabled them to pay 5 per cent. upon the preference stock, £1 17s. 6d. per cent. per annum upon the ordinary stock, to set aside £750 for depreciation account, and to carry forward £229. Owing to the severe weather in the early part of the year, considerable damage was done to the mains and services; but provision for the necessary outlay for repairs had been made in the accounts. The Directors had strenuously opposed a sewerage scheme promoted by the Grays Local Board, by which it was intended to pump the sewage of Grays upon Lodge Farm—a spot within half a mile of the Grays pumping-station; and the Board believed they had succeeded in causing this part of the scheme to be abandoned. The report was adopted.

The half-yearly meeting of the Woking Water and Gas Company was held last Tuesday, at the Offices, Nos. 5 and 6, Great Winchester Street, E.C. The report that was submitted by the Directors stated that the total amount which had been expended on capital account to June 30 last had been £66,889. The revenue for the half year was £2046; and the disbursements had amounted to £871. The balance carried to profit and loss account was £1174; and the sum available for dividend was £1106. The Directors recommended the payment of an interim dividend at the rate of 3½ per cent. per annum, which would absorb £951, and leave £155 to be carried forward. The Chairman (Lieut.-Col. Galt, J.P.) moved the adoption of the report; and, in doing so, remarked that he was glad to say the concern was proceeding very satisfactorily, and every year they were increasing their revenue by the addition of new customers. With reference to the Act of Parliament which the Company purchased for upwards of £4000 some few years ago, he said that it covered a very wide and important district, beginning at the North Camp in Aldershot, and running as far as York Town. Some of the shareholders thought that this Act had hitherto been a dead letter. This was perfectly true. The Directors did not see their way to obtain water on a comparatively economical method in the district where they originally supposed a large quantity of water was to be found; but he was glad to be able to report now that they had received an offer from Farnborough of £500 a year, for three years, if the Company would lay down the necessary mains and give the inhabitants a supply of water. They had received a report from their Engineers (Messrs. Quick) to the effect that the wells and adits in West Horsley had yielded such an abundant supply of water as they had penetrated through the chalk hills that they were assured now that they could easily supply the districts of Farnborough and Frimley. To do this, an expenditure of from £10,000 to £12,000 would have to be incurred; and the question they had to consider was whether the revenue of £500 a year would be sufficiently satisfactory for the commencement. Before concluding, the Chairman expressed the deep regret of the Board at the death of their esteemed colleague, Mr. Edwin G. Fox; and also stated that they had appointed Mr. A. H. Baynes to the vacancy. Mr. C. Horsley, J.P., seconded the motion, which was carried. The dividend having been declared, the proceedings terminated with the usual complimentary vote to the Chairman and Directors.

BELFAST CORPORATION GAS SUPPLY.

Annual Report—The Proposed Extension of the Gas-Works.

At the Monthly Meeting of the Belfast Corporation last Tuesday—the MAYOR (Mr. Alderman Connor) presiding—the annual report of the Gas Committee and a motion relating to the extension of the gas-works were submitted.

Alderman DIXON moved the adoption of the report, which stated that the accounts for the year ended June 30 last showed a net profit of £16,334, after providing for the sinking fund and allowances for depreciation on meters and stoves. A balance of £2379 was brought forward from last year to the credit of profit and loss account, out of which £1000 was paid to the Library Committee for the purchase of works of art, and £286 was expended in obtaining an Electric Lighting Order. The balance—£1092—added to the year's profits, left £17,426 for disposal; and the Committee recommended that £15,000 thereof be transferred to the reduction of the capital account, and the balance carried forward to next year.

Mr. CALWELL seconded the motion.

The MAYOR said that some questions had been put to him by Mr. Finnigan arising out of the report. The first was, "Is it a fact that the Gas Committee, unlike the Improvement and other Committees of the Council, decline to employ members of the Belfast Bricklayers' Society at permanent work in the gas-works, and refuses to accept the rules of the Belfast Builders' Association and Bricklayers' Society, although such rules are adopted by the Improvement and other Council Committees; and, if so, why?" In reply he wished to state that the Gas Committee did not decline to employ members of the Bricklayers' Society at permanent work at the gas-works. The rules of the Builders' Association were not applicable to retort-setters, who had been employed in the work for many years. The second question was, "Is it true that an English firm has secured a contract from the Gas Committee for the erection of a purifier; and, if so, were estimates required by advertisement in the usual way, and why was the contract given to an English firm?" The answer to that was that the Committee had not contracted with any English firm for the erection of purifiers; but the patentees of the process now in use were experimenting at their own risk and cost.

Mr. FINNIGAN said he was extremely obliged to the Mayor for the courtesy with which he had answered his queries; and he gave notice that he should call attention to the subject by a resolution at the next meeting of the Council.

The report was adopted.

Mr. YOUNG subsequently moved: "That a Committee of this Council be appointed to select a site for the enlargement of the gas-works, and report thereon to the Council at the next meeting; the Committee to consist of the Chairmen of the different Committees." He said he moved this resolution, notwithstanding that one similar to it had been passed, and a Committee appointed for the purpose of reporting on this subject. The other Committee had done nothing; and even if they had done anything, it would not attain the object he wished to accomplish, which was to prevent the city of Belfast being left in a state of complete darkness during the coming winter. What he desired was that a move should be made in the right direction, and that for the present no project for the illumination of the city by electric light should take the place of the proposed enlargement of the gas-works. The consumption of gas in the city was increasing considerably; and they were confronted by the important fact that their powers of making gas were not at all equal to the demands made upon them. In other words, if they were visited by a fog, and it was necessary to burn gas during the day, they would not have a sufficient supply of gas to meet their requirements. That the gas-works needed enlarging, entirely independent of all questions of electric light, must be admitted; and it was quite clear that the extensions must be entered upon without delay; otherwise in the coming winter the city might be thrown into total darkness at any moment. He concluded by suggesting various pieces of ground in the city which he thought could be utilized for additional works.

Mr. FINNIGAN said that, although he seconded the motion, he desired to guard himself against any expression of approval of the sites suggested by Mr. Young. He also sincerely trusted that the Committee would not decide to extend the works in Ormeau Park.

Mr. MASTERSON opposed the motion. The matter, he considered, was purely one for the consideration of the Gas Committee, the members of which were in a better position to decide upon it than the other members of the Corporation.

Alderman DIXON said that a Committee had been already appointed to consider the matter; and it would be a strange thing to appoint another one.

The MAYOR, speaking on behalf of the Gas Committee, said that they had appointed a Sub-Committee to search for sites for the proposed extension of the gas-works. They had collected a number; and it was their intention to submit these to some eminent engineer for approval before making a report to the Council on the subject. He would, therefore, protest, on his own behalf and on that of the Committee, against the appointment of another Committee over their heads.

After further discussion, the motion was withdrawn.

THE BOARD OF TRADE AND ELECTRICAL STANDARDS.

Our readers may remember that towards the close of last year a Committee was appointed by the Board of Trade to consider what action should be taken by the Board, under the Weights and Measures Act, 1889, with the view of causing new denominations of standards for the measurement of electricity for use in trade to be made and verified. The Committee consisted of Mr. Courtenay Boyle, C.B., and Major Cardew, R.E., representing the Board; Mr. Graves and Mr. Preece, the Post Office; Sir W. Thomson and Lord Rayleigh, the Royal Society; Professor Carey Foster and Mr. Glazebrook, the British Association; and Dr. Hopkinson and Professor Ayrton, the Institution of Electrical Engineers. Sir T. Blomefield was the Secretary. The report of the Committee has now been issued. In the course thereof, they state that, after a careful consideration of the questions submitted to them, and the evidence given by the various witnesses, they had agreed to the following resolutions:—

(1) That it is desirable that new denominations of standards for the measurement of electricity should be made and approved by Her Majesty in Council as Board of Trade standards. (2) That the magnitudes of these standards should be determined on the electromagnetic system of measurement with reference to the centimètre as the unit of length, the gramme as the unit of mass, and the second as the unit of time; and that by the terms "centimètre" and "gramme" are meant the standards of those denominations deposited with the Board of Trade. (3) That the standard of electrical resistance should be denominated the ohm, and should have the value 1,000,000,000 in terms of the centimètre and second. (4) That the resistance offered to an unvarying electric current by a column of mercury of a constant cross sectional area of one square millimètre, and of a length of 106·3 centimètres at the temperature of melting ice, may be adopted as one ohm. (5) That the value of the standard of resistance constructed by a Committee of the British Association for the Advancement of Science in the years 1863 and 1864, and known as the British Association unit, may be taken as 0·9866 of the ohm. (6) That a material standard, constructed in solid metal, and verified by comparison with the British Association unit, should be adopted as the standard ohm. (7) That for the purpose of replacing the standard, if lost, destroyed, or damaged and for ordinary use, a limited number of copies should be constructed, which should be periodically compared with the standard ohm and with the British Association unit. (8) That resistances constructed in solid metal should be adopted as Board of Trade standards for multiples and submultiples of the ohm. (9) That the standard of electrical current should be denominated the ampère, and should have the value one-tenth [0·1] in terms of the centimètre, gramme, and second. (10) That an unvarying current which, when passed through a solution of nitrate of silver in water, in accordance with the specification attached to this report, deposits silver at the rate of 0·001118 of a gramme per second, may be taken as a current of one ampère. (11) That an alternating current of one ampère shall mean a current such that the square root of the time average of the square of its strength at each instant in ampères is unity. (12) That instruments constructed on the principle of the balance, in which by the proper disposition of the conductors, forces of attraction and repulsion, are produced, which depend upon the amount of current passing, and are balanced by known weights, should be adopted as the Board of Trade standards for the measurement of current, whether unvarying or alternating. (13) That the standard of electrical pressure should be denominated the volt; being the pressure which, if steadily applied to a conductor whose resistance is one ohm, will produce a current of one ampère. (14) That the electrical pressure, at a temperature of 62° Fahr., between the poles or electrodes of the voltaic cell known as Clark's cell, may be taken as not differing from a pressure of 1·433 volts, by more than an amount which will be determined by a Sub-Committee appointed to investigate the question, who will prepare a specification for the construction and use of the cell. (15) That an alternating pressure of one volt shall mean a pressure such that the square root of the time average of the square of its value at each instant in volts is unity. (16) That instruments constructed on the principle of Sir W. Thomson's quadrant electrometer used idiostatically, and for high-pressure instruments on the principle of the balance—electrostatic forces being balanced against a known weight—should be adopted as Board of Trade standards for the measurement of pressure, whether unvarying or alternating.

The Committee close their report by stating that it appeared to them to be necessary that, in transactions between buyer and seller, a legal character should henceforth be assigned to the units of electrical measurement suggested; and, with this view, that the issue of an Order in Council should be recommended, under the Weights and Measures Act, in the form annexed to the report.

It should be mentioned that, in addition to the eminent scientists who assisted the Committee, they had the advantage of the experience and advice of Mr. H. J. Chaney, the Superintendent of Weights and Measures, who, by request, was present at the meetings.

Wigan Corporation Gas-Works.—The Wigan County Borough Council last Wednesday resolved to make application to the Local Government Board for authority to acquire additional land for the purposes of the gas-works. In the course of the proceedings, it was mentioned that new sulphate works were being erected, and that they were progressing satisfactorily.

VENTILATING AND HEATING BY MECHANICAL MEANS.

A Paper read by Mr. W. Key, of the Tradeston Gas-Works, Glasgow, before the British Association.

I propose to describe the arrangements by which a system of mechanical ventilation by propulsion has been successfully introduced to a new hospital recently erected to meet the ever-increasing needs of the populous city of Glasgow; and a few words are needful, by way of introduction, to explain my connection with the subject and how it originated.

As an elected representative of the working classes on the Board o Directors of the Infirmary, I found awaiting my colleagues and myself a few years ago, the important task of considering and approving the plans for the ventilating and lighting of a building on the erection of which the sum of £24,000 was about to be spent. The particular feature of the constructive arrangements to which I thought it desirable for my part to give early and special attention was this question of ventilation, which had a strong attraction for me. Ten years or so before then, an engineer in Dundee—Mr. William Cunningham—had applied mechanical ventilation with success to a small school in that city, of which he was Manager; and his ideas had been caught up and applied by the people of Aberdeen, whose School Board, at the time I first saw the system, had it in operation in two or three of their larger schools from plans and specifications by Mr. Cunningham, and working to their satisfaction. It seemed to me, as I then saw it, that the system was capable of extensive development; but that, in order to produce the maximum results in the way of healthfulness, cleanliness, and economy of working, several improvements were desirable, and that these improvements might ultimately become the leading features of the system.

While I saw my way to devise these improvements, my main object for the moment was to convince my co-Directors that the principle of mechanical ventilation by propulsion was of the highest importance to them, and that the right thing to do was to satisfy themselves regarding it, and have the system applied to the hospital building. I suggested inquiry; and the suggestion was adopted, with the result that the Directors were satisfied that the experiment was worth trying. I was glad of this, in spite of the fact that there was thrown on me the responsible task of engineering and superintending the installation of the system after the building was pretty well advanced and ready for the roof; and, as my contribution towards the erection of the hospital, I accepted the responsibility and prepared the plans. The Infirmary was formally opened for patients on Friday, Feb. 14, 1890, by His Grace the Duke of Argyll.

The buildings comprise an administrative block, which is three storeys in height at the centre, and four storeys at the wings. The ward block, also three stories in height, is erected to the south of the administrative section, and is connected with it by light airy corridors 9 feet wide. The wards are 70 feet in length by 26 feet in width, and have a clear floor space; there being no fireplace, stove, or hot pipes in any of them. On entering the wards, one may notice the entire absence of cornicing and woodwork. The intersection of the walls and ceiling is rounded off, and the corners of the windows finished with beaded moulding flush with the plaster. This simple style of finishing is, however, relieved by the lower walls being covered to a height of 5 feet with cream-coloured enamel tiles; while another notable feature is the absence of square corners—all corners being rounded for the purpose of preventing the deposition of dust and animal effluvia of a poisonous nature. The portion of the building between the ward staircase and administrative block is two storeys in height; on the upper floor is the children's ward, and on the lower floor are the servants' rooms. At the entrance to each ward is the ward kitchen and nurses' rooms; while at the other end are the bath-rooms and lavatories, which are cut off, and ventilated and heated quite distinct from the wards.

Let me state now what I felt then, and have more fully recognized since, to be the essential features of a successful installation of mechanical ventilation: (1) The propulsion of fresh air into a building at its base and not the extraction of foul air by way of the roof. (2) The washing or scrubbing of the entering air by filtration through a damp surface, and its perfect purification from fog, and separation from the floating impurities common to the atmosphere of large towns. (3) The warming of the air before it reaches the rooms to be ventilated, and the maintenance in these rooms of an equable temperature in all weathers without aid from any hot-water pipes, stoves, or fireplaces within the rooms. (4) The supply of the best and most economical motive power and fan for the propulsion of the air; and the provision of sufficient heating surface with effective air-tempering appliances, all regulated to the size of the building, and to the purposes it is intended to serve, with due regard to safety and economy in the cost of warming. (5) The diffusion of the fresh air in the rooms ventilated; and its final expulsion from them, as well as from the whole building in a way to prevent the deposition of dust particles or any possibility of down-draughts or backward currents. (6) The constant renovation of the air in rooms occupied, at least six times per hour, in a manner to occasion no draughts or other inconvenience to those breathing it.

It will be seen, therefore, that while capable, as I shall endeavour to show, of producing admirable results, mechanical ventilation is not a system to be applied blindly; but, on the contrary, that the form of its application must vary more or less with the architectural features and purposes to which each building is to be applied. I confine myself, however, to my experience of the Infirmary; and I proceed now to explain the manner in which I have endeavoured to carry out the principles that have just been stated.

The Infirmary contains 400,000 cubic feet of air space, and the air-inlet, main air-ducts, and air-channels into the wards, rooms, and corridors, are designed to permit of the whole air of these apartments being renewed from five times per hour to nine times per hour, as may be found desirable or necessary. The cold fresh air is drawn by the air-propellers down a capacious air-inlet, 16 feet by 4 feet, lined with white enamel bricks, and open to the sky. The mouth of this inlet is placed 10 feet above the level of the ground, to obviate the drawing into it, during the stormy and dry weather, of the dust that is constantly being stirred up nearer the surface.

To renew the air of the Infirmary six times per hour—and it is nearly all mechanically ventilated—2 million cubic feet of air are required. This volume of air as it passes down the inlet is filtered and washed by passing through an air-washing screen, formed of cords of horse hair and hemp closely wound over a top rail of wood and under a bottom rail; the whole forming a close screen 16 feet long by 12 feet high, or nearly 200 square feet of surface. There is a constant trickling of water down this screen to keep it wet; and the air, in filtering through it, has the dust and soot particles removed. When once these have adhered to the wetted surfaces, no current of air, at whatever velocity, can ever remove them; and they are carried down to float off at the drain by the falling water.

An automatic flushing-tank is fixed in a position whereby 20 gallons of water are instantaneously discharged over the surface of the screen every hour, to flush and remove any accumulation of wetted dust, soot, or germs which may not be removed from the screen by the water trickling over its surface. This goes on automatically day and night; and even in the district where the Infirmary is built—near to the Queen's Park—where the atmosphere is supposed to be the purest in the city, the amount of soot particles extracted by this screen is something surprising. A piece of jute Hessian cloth, placed in the current of air before the screen was erected, became in six hours nearly as black as graphite.

One of the chief advantages of the washing-screen has proved to be the facility by which it removes every vestige of fog. During the past winter there were many days of fog of very great density, yet within this building, so soon as this screen was passed, the air was beautifully clear and bright. I deprecate the employment of any dry screen of cloth or cotton wool, as being a positive source of danger, owing to the accumulation of dust and germs, which must fall off, under the velocity of the incoming air, as the screen becomes laden, and be floated throughout the building. After passing the wet screen, the air is warmed by coming in contact with steam-heated coils erected on a wooden platform. There are eight distinct coils in the air-chambers on this platform; and the steam to each coil being admitted by a gun-metal wheel-valve, the attendant may turn on one or more of the coils, or admit only a thin stream of steam to each, and thus increase or modify the temperature of the various coils at pleasure. The coils are clustered in a space 16 feet long by 9 feet high, and are formed of the best hydraulic tubes ⅞-inch bore.

During winter it frequently occurs that the mornings are bitterly cold with keen frost, and provision is made for warming the air accordingly. But by eleven or twelve o'clock, the sun shines forth, and the air is warm and pleasant; to be followed in an hour or two by the air again becoming intensely cold. To meet this emergency in all installations of my system, air-tempering doors are now erected between the incoming washed air and the heating coils. There may be from three to six of these doors, capable of closing in the whole of the heating-coils, and so preventing the air from coming into contact with them on entering. While this is so, there is also provided a corresponding number of bye-pass doors, which are opened under the coil platform so as to bye-pass the air, which is prevented from passing through the heating-coils by the upper doors being shut. In this way the attendant can keep the temperature uniform, and make alterations as rapidly as they can take place with the external air. In opening one or more bye-pass doors, and closing those in front of the coils, the cold air which flows through mixes with the warmed air from the coils, as it passes through the air-propeller, and is forced inwards at the desired temperature. This can be done at once, without waiting for the coils to cool down after shutting off the steam, or withdrawing the furnace fire when hot-water pipes are used to warm the incoming air; and a great advantage of this system of tempering is that it does not reduce the volume of air moving inwards.

After passing the air-tempering appliances in the Infirmary, two air-propellers of the Blackman Company's type collect the air and propel it forward through the main air-ducts leading to the administrative block and to the wards. The form of the blades of this propeller is well suited for forcing the air along close ducts and channels; and the fans have been running for two years and a half, for 23 to 24 hours daily, without the slightest hitch having occurred by their use to interrupt the air supply. This must be considered a very severe test of their efficiency and durability.

The gas-engines employed were of the best possible type for ventilating purposes. The late Professor Carnelly, of Aberdeen, had made tests, by which he found that, while Messrs. Crossley Brothers' "Otto" gas-engine was propelling the Blackman fan, 23 per cent. more air was impelled into the building per cubic foot of gas used than by the other competing engine driving the same fan. Crossley's engines performed their work to the satisfaction and admiration of all who saw them; and the only time these engines were stopped was for half an hour daily. One engine was stopped at a time, so as to cool and thoroughly oil it, during which operation the other engine performed the duty of propelling the whole air into the building. These engines required and received very little attention, and developed the power required on an exceedingly small consumption of gas; being equal to 2d. per million cubic feet of air propelled into the Infirmary. This was latterly reduced to 1·42d. per million cubic feet of air, by the introduction of my gas-engine exhaust-box, which prevents the noise of the explosive discharge from the cylinder being heard, although the products of combustion are discharged into the atmosphere within a few feet of the engine, and these are purified also in passing through it. The engines were relieved of the pressure on the exhaust side of the piston, which formerly was a necessary accompaniment to the discharging of the gases along narrow tubes with the disagreeable noise with which we have been familiar, and which is thus preventable.

The warmed air is impelled by this mechanism along the main air-ducts leading to the wards and administrative chambers, and is further heated, either for the wards or for the administrative block, by passing upwards through secondary heating-coils placed at the base of the flues leading to the several apartments and corridors. The air entering each ward by wide, shallow ducts placed along the wall 5 feet above the floor, the incoming current is directed towards the ceiling, and is diffused throughout the higher levels; moving steadily downward from ceiling to floor. In this way, while the air which had previously filled the space of each ward and chamber is forced outward, the warmth of the fresh incoming air is utilized, warming ceilings, walls, and window spaces before passing off at the outlets.

The air forced out of each ward and room passes away by openings placed at the floor-level. These admit the exhaust air into ducts within the walls which lead up to the roof, where exhaust air-chambers are placed over the ceiling joists, into which the various flues discharge. The air thus collected is led by wooden ducts, or ducts framed with wood-lath and plaster, to the roof ventilator outlets. Formerly the air from buildings ventilated on the propulsion system was discharged into the space under the roof, where the dust was deposited over the ceiling joists, and allowed to collect there. In the absence of means for cleaning the spaces out between the joists, the air found its way out by valve and louvred frames in the gables, or placed over the ridge of the roof. The air is led by my method direct to the roof outlet within these ducts, which are periodically cleaned out and washed. This roof outlet is formed square by setting up corner posts, with louvre boards between them on each side, and roofed in. Within this outer frame are placed the valve-frames, through which all the outgoing air must pass. The valves are made the full width of the frame, in one piece of cloth 6 inches deep. By these a free passage is at all times available for the air to escape. Even in tempestuous weather, or during a gale, the outward flow is never interrupted; for while the valves are closed on the side of the cupola exposed to the influence and pressure of the wind, those on the lee side are under no such pressure—the air passing out uninterruptedly. At the same time the closed valves on the windward side prevent any air whatever being admitted on that side to check the outward current.

The bath-rooms of the Infirmary are heated and ventilated separately, and the temperature can be raised to any degree the Medical Superintendent may desire; so that patients, on leaving a warm-water bath, will step into a warm-air bath. The towels also and the napery of the establishment require no special heating appliances, as the whole air of the building is kept at a uniform temperature.

By this system, so imperceptible is the movement of this vast volume of air through the wards, that when a velocity has been given to it sufficient to renew the whole air in seven minutes, not the slightest draught is observable. It is only when a lighted taper is placed in the outlet at the floor-level that the pressure within the apartment is observable; and the force of the current is at once perceived, for the light is extinguished thereby. The copious volume of air blown into each ward is such that it may be said that none of the inmates will ever inspire air which has previously passed through his lungs or those of any of the other inmates.

General satisfaction has been expressed at the condition of the air in the wards at all seasons of the year. Even the weak and delicate patients, from whatever cause they may be suffering, enjoy the comfortable fresh airiness of the wards equally with the strong, robust, and healthy visitor or official. There is positively an entire freedom from draughts, and windows are never opened. There are ten beds, each containing a patient, set within 18 inches of, and right across ten of the outlets near the floor, without the patients being sensible of any movement of air, and certainly no draught. There is not the slightest pulsatory motion of the air. There is felt a sensation of airiness without any perceptible movement. The delivery of air throughout the building is unaccompanied by any sound whatever. A perfectly equable temperature, under the varying conditions of atmospheric changes, is remarkably easy to maintain by day and night. The entire air supply is received into the building by one inlet—thus ensuring that it comes from the desired quarter and uncontaminated; while the outgoing air passes off by several outlets. All the air is heated and tempered in a manner which does not interfere with the *volume* of the air supply. This is not dependent on the condition or temperature of the atmosphere, or on whether the wind blows or the air be still; it being maintained positively, and of a known quantity. The air of the building is under a slight compression; and by a glass U-pipe containing water—one end connected by a rubber tube to the outer atmosphere, the other being open to the internal air—a pressure of 1-20th to 1-10th of an inch of water column is recorded. There being no fireplaces, no coals require to be carried, no ashes are removed, and little dusting is needed. There is thereby a great saving of labour. There is none of the noise which usually accompanies poking and renewing of fires; and the uneven temperature of a room, by fires newly filled, burning brightly, then burning low, is totally absent.

The wetted surfaces of the air-filtering screen are a decided improvement upon any dry-cloth or cotton-wool screens. These last must be frequently renewed, as they become foul. I consider that it is highly objectionable to pass air into any building through a dry screen in process of becoming foul, or filtered through any kind of dry floor matting, which must collect its millions on millions of germs, which certainly will be scattered by the incoming air throughout the chamber, especially when disturbed by the feet of those in the apartment. This dust, with the accompanying germs, will be kept floating in the air by the upward currents, and be productive of serious inconvenience to those who perforce must inhale them.

All chambers wherein many persons congregate should have the air supply passed downward from the upper levels near the ceiling to the floor, so that all dust produced by the movement of the feet on the floor, and exhalations from their bodies, may pass off downward, and not mix with the air to be inhaled. All fresh air should reach the nostrils from above, in place of from a lower point upward, accompanied as it must be by these emanations and dust particles. By this system, lofty ceilings are not a necessity; and ceilings only moderately high are a decided advantage. Consequently, in erecting new buildings, in many cases such a saving of masonry; can be effected as will pay for the entire first cost of an installation. Faulty plumbing work is not the serious matter with this system it is with all others. The building has the whole air within it compressed under a slight pressure; so that should there be any leaky joint of a drain or soil-pipe within the premises, sewer gas cannot escape, but the pure air of the building will find its way through any such orifice into the drain. Ventilation by extraction operates in exactly the opposite direction.

At the Victoria Infirmary, by the present arrangements, the three wards can simultaneously have the temperature of the air increased up

to 70° or 75° Fahr., while the rest of the building may be kept at 58° or 60°. In the same way the wards may be kept at 55° to 60°, while any other portion may have the temperature of the incoming air raised to 70°. I have, however, designed the heating arrangements for the new wards now being erected so that the female medical ward, the male medical ward, and the surgical ward can each have any temperature above 50° Fahr. maintained in either of them as may be desired, and independently of the others.

In January, 1890, on taking observations of the volumes of air passing into buildings, I found that 51,080 cubic feet of washed and warmed air was being propelled into the Infirmary buildings every minute. This was a volume of 3,064,800 cubic feet every hour, or equal to a renewal of the air every seven minutes, or nine times per hour. At that time the walls and plaster work were being rapidly dried, to allow of getting on with the painters' work. In December, 1890, when the air volumes for each apartment had been regulated, the Medical Superintendent (Dr. Mackintosh) made observations of the volumes, accompanied by the Engineer, among whose duties were those of attending to the ventilating apparatus, and that for the electric lighting of the establishment. Two anemometers were kept running for two hours in each of the two ducts, when it was found that a volume of 2 million cubic feet of air was being propelled into the Infirmary every hour, at a cost for power, for gas consumed by the Crossley "Otto" gas-engines, of 1¼d. per million cubic feet of air propelled—the gas costing 2s. 6d. per 1000 cubic feet. This was verified by running one of the air-meters for two hours in the fresh-air inlet, when there was found to be only a very slight discrepancy; the meter in the cold-air inlet registering 1,971,200 cubic feet per hour, or a difference of 28,800 cubic feet less. This volume of 2 millions was equivalent to renewing the air of the apartments ventilated mechanically six times per hour.

In order that you may form some idea of how this cost for renewing the air of these buildings six times per hour will compare with others, let me consider a school for instance. A school, with floor space for 1250 pupils, can have the air thus renewed six times, and warmed comfortably in mid-winter, at a cost of 1½d. per hour, or 7½d. per day of five hours; being equal to 3s. 1½d. per week of five days for the gas required to drive the engine. A church seated for 1200, 2½d. per hour. In fact, the advantages of such a method of ventilating a building, or cluster of buildings as I have described, cannot be over-estimated. They are legion; and cannot be obtained by any other system, nor by simply removing oneself from this country and its climate to one under sunnier skies. Every building ventilated and heated as the Victoria Infirmary is ventilated and heated, must prove to be a first-class sanatorium.

THE GAS-STOVE TRADE.

From a Correspondent.

Manufacturers of gas heating and cooking appliances have for a long time been reaping a golden harvest. It is a good many years since the first tin box was made into which a gas-pipe was placed, and a shelf partitioned off the products from the heating chamber. The tin box developed into one of zinc, and then into one of iron sheeting. Afterwards came a double casing packed with non-conducting material. The internal fittings of the stove were so manipulated that at last the flat iron shelf found a companion in the grid. The heating-tube, made in various forms of cast and wrought iron barrel, does not appear to have suffered much change except that it was in the various types of Bunsen burner, and the size and the number of holes for producing pure combustion were different. Probably the greatest victory achieved was when the inventor found that the top of the gas-stove was the very place to put boiling-burners. These were made; and they still remain, cast in all sizes and shapes, from a ring to a short length of straight barrel. In time the whole structure of a gas-stove came to be manufactured entirely of cast iron. Then commenced enamelled sides, removable bars, apparatus for grilling, improved taps, and so on; until to-day the gas manager is perplexed to know which stove is the one to adopt.

This brings me to a subject which affects the stove manufacturers and the gas managers. The latter—and they number hundreds in England—have resolved that they will only lend out on hire to the consumers one pattern of stove. Their reason is that any improvement in a particular appliance is an inducement to a consumer to change the old-pattern stove for one of a new design. Hence a gas company find that they have soon on their hands a stock of stoves which will not realize the number of shillings that they cost pounds. This policy of keeping exclusively to one stove maker is rigorously adopted in many towns; and it is a policy over which the manufacturer (whoever he may be) chuckles with delight, as he finds a constant market, and realizes a good price for his productions. Thus it is many old-established gas-stove makers are able to hold their own against all comers.

It is a debateable point whether the principle of "one maker and one stove" is a right one. Taking a progressive line of argument, I should say that it was a mistaken policy. I know of scores of places where the oldest patterns of stoves of two of the principal makers are on hand; and they appear likely to be, for the simple reason that the consumers have already had experience of the heavy gas bills and the uncleanliness resulting from the use of the "old stove." Now, if all these stoves were broken up for old iron, and others of the latest patterns—from the same or other makers—were introduced, the public would readily take up the new thing, and permanently adopt it. At present the old stoves are a stumblingblock to progress.

Another reason adduced by gas managers in support of the proposition that there should not be an open field to gas-stove makers is that it means a multiplicity of accounts and a number of travellers. I quite agree with this. But against the additional trouble I would urge that the more competitors there are in the gas-stove trade, the better it will be for the gas manager and the public. There is no doubt that the young gas-stove firms which have sprung into existence within the last few years produce a very good article at a low price; and they should consequently be encouraged. The Gaslight and Coke Company have, I understand, seven accounts open for cooking and heating stoves. Why should this not be twelve or fourteen? Let there be a fair field and no favour. At Sheffield, the stove trade is practically open to all comers. A list of makers is kept, and at the end of each quarter the total number of stoves sold or hired is placed to the credit of each. I have reason to know, in regard to this, that one firm of heating-stove manufacturers sold 700 in one half year; while the cooking-stove sales were hardly worth mentioning. Another firm had managed 120 cookers and no fires; while a third firm had not been patronized in either department. The public were the censors; and their choice ruled the market. This is as it should be. It is very simple to come to a clear understanding with a gas consumer at the beginning. Let him choose his own stove; and it should then be a part of the contract that it cannot be exchanged for another make unless it is for a higher-priced article. This would mitigate the evil of ladies' fancies leading them to change their stoves merely to gratify a little fastidiousness.

Altogether, the season just closing has been a very good one for the gas-stove trade. The old firms have exhibited in the old places, and the young ones have broken ground in towns and villages where gas-stoves have never been seen before. On the whole, this important industry is likely to retain its hold on the public, and, by gas managers giving the matter a large-minded consideration, the trade will continue to develop until the best types of cookers and gas-fires will become absolutely indispensable in every household.

METROPOLIS WATER SUPPLY.

Mr. Webster's Scheme for a Supply of Spring Water.

In the article on "Water and Sanitary Affairs" in the JOURNAL for the 25th ult., we discussed the project of Mr. G. Webster for providing London with an auxiliary supply of water from the chalk formation in Hertfordshire. The following are some particulars in regard to the scheme:—

As long ago as 1884, Mr. Webster was engaged in making a well in the chalk on his property at Harefield Grove, near Rickmansworth, with a view to supplying his gardens and farms with water. Having consulted Mr. Claud Monckton, C.E., as to the probability of obtaining water in the district, the latter gentlemen advised the sinking of a well at Springwell, between the Grand Junction Canal and the River Colne. This land Mr. Webster eventually purchased; and he sank a well 12 feet in diameter, with the result that, at a depth of 20 feet, the pump was overcome by the inflow of water, which rose to the ground surface, and has ever since been running to waste in the river. Subsequently, a more powerful pump was employed, and the brickwork of the well was carried down to a depth of 30 feet. Seeing the large volume of water from the first 30-feet well at Springwell, Mr. Webster determined to embark upon the enterprise of searching for water on a large scale, with the object of ultimately supplying at least a portion of the Metropolis with pure spring water. With this view, he purchased further property at Rickmansworth, extending nearly across the Colne valley; and a deep boring was made in the well at Springwell. Two further wells and bore-holes were sunk there, and two wells with deep bore-holes on the Rickmansworth property; while nine trial bores, 9 inches in diameter and from 90 to 100 feet deep, were made in the same locality. Easements were obtained for connecting the Springwell and Rickmansworth supplies by a main. A reservoir was also constructed at Harefield Grove, at about 340 feet above Ordnance datum. It is capable of containing 5 million gallons of water; and it could at any time be very considerably increased.

On the occasion of the recent visit of certain members of the Hygienic Congress, and other gentlemen, to Rickmansworth, on the invitation of Mr. Webster, the party first inspected No. 4 bore-hole, situated in the station field. The well here is 12 feet in diameter in brick and cement, with a depth of 30 feet, and is sunk through the gravel into the solid chalk. The hole is 40 inches in diameter to a depth of 115 feet, and 24 inches below that; and it is lined with steel tubes from the water surface well into the solid chalk. The total depth of the bore and well is 184 feet; the water rising to the surface. At No. 5 bore-hole, which was next visited, the well is 4 feet in diameter, in brick and cement, with a depth of 25 feet. The hole is 23⅝ inches in diameter. The total depth of the bore and well is 184 feet; the water rising to 2 ft. 6 in. from the surface. The party then proceeded in brakes to view the bore-holes at Springwell, about a mile distant. At No. 1, the well is 12 feet in diameter, and 30 feet deep, sunk through gravel to the solid chalk. The bore is 40 inches in diameter to 105 feet, and 24 inches below that. The total depth of the bore and well is 282 feet; the water overflowing. No. 2 bore-hole has a well 8 feet in diameter and 20 feet deep. The hole is 24 inches in diameter throughout; and the total depth of the bore and well is 192 feet. At No. 3 bore-hole the well is 8 ft. 4 in. in diameter and 30 feet deep. The hole measures 40 inches in diameter throughout; and the total depth of the bore and well is 115 feet. In all three cases the water overflows. The borings were made by Messrs. Mather and Platt, of Manchester.

It is proposed to connect the wells at Springwell and Rickmansworth, and pump the water up to reservoirs at Harefield Grove, at a height of 340 feet above Ordnance datum, whence it would be conveyed by gravitation to the Metropolis; the mains being carried along the Metropolitan Railway to the Finchley Road and the Grand Junction Canal to Paddington, and across country to Hanwell, where they would join the Grand Junction Water Company's area; easements having been obtained by Mr. Webster from the various authorities and landowners concerned. Mr. Monckton states that from practical pumping tests, extending over several consecutive days and nights, he estimates the present quantity of water available from the existing wells to be at least 10 million gallons per 24 hours; and he is of opinion that, by a further system of sinking and driving adits, this supply could be doubled. With regard to the purity of the water, Dr. Percy F. Frankland, after subjecting it to analysis, certifies that it is of excellent quality for drinking and other dietetic purposes; and that the hardness is neither excessive nor much greater than that of the river water supplied to London, while it is less than that of the Kent

Company's deep-well chalk water. The hardness also being of the kind known as temporary, could be greatly reduced by treatment with Clark's process. After such treatment, Dr. Frankland considers that the water would be unsurpassed for all domestic purposes. According to Mr. Monckton, the softening process could be applied at the site of the present reservoir, where there is ample area for constructing both softening and service reservoirs up to the extent of 150 million gallons.

LANCASTER CORPORATION WATER SUPPLY.

Annual Report.

At the recent Quarterly Meeting of the Lancaster Town Council—the Mayor (Mr. Alderman Blades) presiding—the annual report on the affairs of the Water Department, prepared by the Borough Accountant (Mr. W. Clough), was submitted. It stated that, during the year ending June 30 last, the receipts from the sale of water were £9377, as against £8671 in the previous year; being an increase of £705. The total income amounted to £9620, as compared with £8949; and the total expenditure was £8471, as against £7953. The net profits for the year were £1148; being an increase of £152. The expenditure during the year on the construction of the Damas Gill reservoir was £4951; and this account now exceeded the borrowing powers of 1886 by £5364. The total outlay on the new main, from Brow Top to the service reservoir was £6374. The capital debt under the Acts of 1852 and 1855 had now been redeemed; and the amount of debt redemption would next year be considerably less. For the past year the item stood at £2338. Mr. Huntington, in proposing the confirmation of the Water Committee's proceedings, said the annual financial statement was an agreeable one; seeing that their receipts from the sale of water showed an increase of £705. But while the cost of maintenance had been less than last year, he was sorry to say that the general expenditure had been higher. This was chiefly accounted for by the increased borough and district rates, amounting to £261. The net profits had been £1148, as against £995; showing an increase of £152. Out of the £1148, they had decided to place £548 to the credit of the renewal fund, and to hand over the balance of £600 to the borough fund. He would like to explain why the Committee proposed to hand over £600 this year. He took quite a different view in the management of their finances to what the Gas Committee did. While the ratepayers were responsible for the whole of the departments of the Corporation, they ought to have a share of the profit, when it could be spared, as well as the responsibilities; but he could not agree that the present owners of water and gas works should pay a larger proportion out of the proceeds than could fairly be expected of them. The ratepayers of to-day ought not to be required to provide for those of many years hence. Next year they would have a less sum to pay by something like £1500, owing to the redemption of the capital debt under the Acts of 1852 and 1855; and therefore they proposed to apply the balance of profit in the manner he had specified. Mr. Gilchrist seconded the motion, which was passed.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

One of the disadvantages of the corporation management of gas-works is exemplified by what is occurring at Aberdeen just now. I refer to indiscretion on the part of some members of the Town Council, who are, for all practical purposes, the owners of the undertaking. As is now well known, a set of West's stoking and coal-breaking machinery has been introduced into the Aberdeen Corporation Gas-Works; and, in connection with the working of it, a re-arrangement of the working staff was necessary, which led to a number of old hands in the works being deprived of employment. This step has been seized by the local Socialists as a text on which to base harangues upon the iniquity of capital—a circumstance which would be of little moment did it not receive the support of some within the Council itself. Although the machinery has not yet been taken off the hands of the constructor, the Council have been led to call for a return to show whether any saving has been effected by its employment. The instigators of this movement were those who have been affected by Socialist arguments, and by very extraordinary Socialistic figures as to the amount paid in wages for a certain output. It is to me matter of wonder that any member of the Town Council should become the tool of persons whose object is to depreciate a Corporation department; and it is more amazing to me how the Council should have allowed itself to be jockeyed by any of its members showing such weakness. Fortunately, if the Council were weak-kneed in the matter, the Gas Committee have not been bereft of common sense, and when the remit from the Council came before them on Monday, they resolved to delay making up their report until they get the returns for the last three months of this year. This resolution was not, however, adopted without an effort on the part of Mr. Pratt, who is one of the troublesome ones, to obtain the report forthwith. He did not succeed; but in the discussion which he instigated, it was elicited from Mr. Smith, the Gas Manager, that he was convinced that during the time the machinery has been in operation it has effected a saving of £1100. What is, perhaps, the chief significance of the Committee's resolution is that long before their report can be submitted, the municipal elections will be past, and those members of the Council who may have been looking forward to making use of it for electioneering purposes will be baulked in their intention. This is the weakness of corporation management—that individual councillors sometimes do things which, however useful to themselves, are not beneficial to the gas undertaking. We have seen such things happen in more places than one. To all who adopt such tactics, the question may well be put whether they recollect their declaration when they took office, and whether they consider that needless agitation is the best way to fulfil their solemn obligation to faithfully attend to the business of the undertaking. Unfortunately, local newspapers usually, for business purposes, take the side of the agitators. Were they to do their duty, and rightly inform the public, I am satisfied that Councillors of the Pratt order would get "short shrift" from the electors at the first opportunity.

It is always as pleasant, and frequently as profitable an occupation to note improvements in small as in large gas-works. Scotland is full of small works; and though their results may not have the heroic ring which is usually associated with the annual reports of larger gas undertakings, the same spirit animates the managers of both. The gas industry is a homogeneity quite as distinct as that of the human body itself; and of it it may as truly be remarked that when one member suffers all members suffer, and when one member rejoices all the members rejoice. Unfortunately, it cannot be said that all either suffer or rejoice "alike;" for though it be true that times of prosperity affect all pretty much the same, in times of adversity all do not suffer alike. When coal and labour are cheap, the small works as well as the large ones derive benefit; but when the price of coal rises and the cost of labour increases, the hardship is more accentuated in the case of the small than in that of the large undertakings. To the manager of the large gas-works dear coal means an increased revenue from residual products; but to the manager of the small works residuals are of little account, and the increased charges fall entirely upon the cost of gas, the price of which must perforce be raised. The manager of the Macduff Gas-Works, which I visited yesterday, informed me that the price which he could command for residuals was so small that it would be a loss to sell them; and that consequently everything was thrown out upon the beach of the Moray Firth, excepting the tar. This they make use of, by a simple appliance, for the firing of the retorts; and any surplus which they have is in request by the local fishing community for their boats. In the county town of Banff, where the gas-works had been for nearly 60 years in the charge of the late Mr. Watson, matters had been allowed to run in their old groove, until they bade fair to end in ruin. The distribution plant, thanks to the nature of the subsoil, is still good; but the works a year ago were in so dilapidated a condition that the heart of the bravest of managers might well have quailed at the prospect of renovating them. In the hands, however, of the new Manager (Mr. P. Macdougall, late of Peterhead), quite a remarkable transformation has been effected. The old-fashioned direct-firing retorts have given place to a bench fired on the regenerative system introduced by Mr. G. R. Hislop; and an exhauster has been fitted up. The condensing and purifying plant has not yet been tackled; but it is intended to renovate the former next year. With these in order, it will be possible to greatly improve the manufacture of gas, and to cheapen the output as well. Mr. Macdougall is a young man of energy; and if he remain long at Banff—which is improbable, as the place does not afford scope for the exercise of his talents—he will without doubt strengthen the position of the Gas Company.

The Gas Meter Inspection Department of the Edinburgh Corporation is a very profitable one, the account connected with it having a balance at its credit of about £8000, most of which is invested in city bonds. The account is going on accumulating; but hitherto there has been no provision in local statutes for the utilization of it. This has now been rectified by an Act of Parliament obtained last session, which gives power to assimilate the account with that of the inspection of weights and measures. The Magistrates may therefore appropriate the existing surplus, and apply it to general purposes. It is proposed by the City Chamberlain to sell the city bonds; and it is expected that, with the enhanced price which will be derived from them, a sum of £9000 will be realized. Probably the Corporation could not do better than apply it in the researches under their Electric Lighting Provisional Order, which they will now require to enter upon.

As I foreshadowed several weeks ago, the consulting engineers to the Edinburgh Water Trust have, in their report just issued, recommended the Trust to adopt the Manor scheme for procuring any addition to the water supply. They give the results of their investigations into the two other schemes which were submitted to them—the upper waters of the Tweed and St. Mary's Loch—and the Trustees have now the difficult task before them of making up their minds as to which of the schemes they will adopt. In this they are likely to have a good deal of trouble, as there will in all likelihood be an attempt made to show that there is no necessity at present for an extension of the water supply.

The action which I mentioned a short time ago as having been brought in the Aberdeen Sheriff Court by the Police Commissioners of the burgh of Banchory, to recover £500 as damages in respect of a letter published in a newspaper which reflected upon the water supply of the burgh, has been dismissed by the Sheriff. His Lordship said the grievance complained of by the Commissioners was that an indignity had been offered to the burgh, with the result of operating a loss to individual householders and owners of property, and tarnishing their own administrative functions. It was not necessary to consider whether an action would lie in the circumstances stated, at the instance of individuals. Expectation of injury was not injury itself; and the remoteness of the damage was a plea that would come in and be a formidable one. The Commissioners occupied a public platform on which they could deal more effectually than anywhere else with accusations made against them; and therefore they were themselves armed with a protection against injury which would amply avail to redress all the wrongs which they might be able to show they had sustained.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

I am in duty bound to supplement my "Note" in the last issue of the JOURNAL, regarding the appointment of a gas manager by the Kirkcudbright Gas Commissioners. Depending on the correctness of a report given in a South of Scotland newspaper, I used a remark which was alleged to have been made by Mr. Hogg, Convener of the Gas Committee, to the effect that Mr. M'Lusky was the only one of the five candidates for the post in the short leet who had a first-class certificate in chemistry, besides obtaining prizes for mechanical drawing. Such a misrepresentation of the facts of the case was calculated to injure the reputation of Mr. G. R. Love, Assistant-Manager of the Paisley Corporation Gas-Works, if allowed to go uncontradicted—that gentleman being the only other candidate who was put against Mr. M'Lusky at the final vote. Mr. Hogg writes me to say that the statement just referred to was a mistake—a reporter's error; and he asked me to make the necessary correction, which I most willingly do;

As to certificates, here are some of his examination credentials: Gas Manufacture—first class in elementary grade, second class in honours grade; Theoretical Chemistry—first class in advanced stage; Practical Chemistry—first class in elementary grade; Machine Construction—first class in advanced grade. He has also gained first-class certificates in the elementary stage in theoretical mechanics and applied mechanics, and mathematics; together with a second class in magnetism and electricity. It is also specially worthy of mention that Mr. Love has held two "Barbour" technological bursaries in connection with the Paisley Science Schools—one of £5 and one of £7 10s.

Out of the interesting case of "Reasonable Security" which was reported in the JOURNAL three or four weeks ago (p. 270), there has arisen an action-at-law before Sheriff Birnie, in the Glasgow Sheriff Court. It is a small debt action, but it involves important issues. The action was raised at the instance of the same Mrs. Frame as was mentioned in the former notice, and it concludes for damages through (1) refusal of the Glasgow Corporation, as Gas Commissioners, to allow interest upon the money deposit offered by her on the 9th of April last, in security for payment of the gas to be supplied to her premises at No. 182, West Graham Street, Glasgow; and (2) the failure of the Corporation to supply gas to the said premises upon the said offer of security being made by her from the said date till June 3, 1891. The case was recently debated before Sheriff Birnie by the pursuer's agent and by Mr. John Bowers, from the Town Clerk's office, acting on ehalf of the Gas Commissioners. The learned Sheriff did not there and then give a summary decision; but he made avizandum of the matter, in order that he might consult the legal decisions bearing on such cases.

At the ordinary meeting of the Town Council of Glasgow held on Thursday, the recommendation of the Gas and Electric Lighting Committee as to the appointment of Mr. William Arnot, of London, as the Electrical Engineer under the Corporation, was approved of without comment.

At the last meeting of the Motherwell Police Commissioners, Mr. Jack gave notice that at the next meeting he would move that a Committee be appointed to consider the question of the Commissioners taking over the gas supply undertaking.

The Glasgow pig-iron market has continued without special feature. Only a few transactions in Scotch iron have taken place; and the price has ranged between 47s. 2d. and 47s. per ton cash. Holders seem to be most unwilling to allow the price to come below 47s. There has been rather more demand for hematite and Cleveland warrants; and prices have fluctuated between 47s. 11½d. eleven days and 48s. 6d. cash for the former, and 39s. 5d. and 39s. 9½d. per ton cash for the latter; the closing prices yesterday afternoon being, respectively, 48s. 6d. and 39s. 8d. per ton cash buyers. Towards the end of the week, the disposition to buy iron became more decided; but the amount of business done was small.

A firmer tone has pervaded the Glasgow coal trade this week, but prices cannot be said to be any higher. It had been anticipated that house coal would have been raised 1s. per ton this week; but, owing to the want of unanimity amongst the masters, the advance has been postponed until next month. The export demand is broadening out; while the production is more than ample, owing to the miners working without a murmur. Main coal has been given at 7s. 10d. to 8s. Splint, as has been the case for a couple of months, is again quiet at 8s. 9d. Steam descriptions have met a better demand—the improvement in the inquiry for household coal opening up the channel for steam. The ruling price has been 10s. to 10s. 9d. per ton. Dross has been almost unsaleable for the secondary qualities, but the finer classes have moved off well. The bulk of the contract for the Danish State Railway has gone to Slamannan, where 25,000 tons have been placed.

A Magistrate "Promoted" to a Nuisance Inspectorship.—According to a report in a local paper, the Chairman of the Water Committee of the Heywood Corporation (Mr. B. Buckley) has just been selected by the Health Committee, out of 98 applicants, for the vacant position of Nuisance Inspector of the borough, which is worth practically £90 a year—the salary offered being £80, and there being an annual payment of £5 a year for the duties of inspection under the Canal Boats Act, and a Commission of 2½ per cent. for collecting. Being a member of the Town Council, Mr. Buckley will have to resign his position when the appointment has been formally confirmed; and as he is also a member of the Borough Bench, it is probable that his magisterial functions will also have to cease.

The Gas Supply of Teignmouth.—At the meeting of the Teignmouth Local Board last Tuesday, the Gas Committee recommended that the price of gas be reduced from 4s. 2d. to 3s. 9d. per 1000 cubic feet from Sept. 29 next, and that in order to economically meet the present demands for gas, and the estimated increase in consumption, steps be taken to provide for additional storeage and mains at a probable expenditure of £6000. The adoption of the recommendations having been moved and seconded, there was some opposition to the proposal to spend the sum of £6000. Mr. Jarvis said it seemed to him that the consumption of gas was decreasing rather than increasing. The existing debt on the gas-works was £11,048; and this further sum would make it £17,000. Yet they were told that the concern was a paying one. Mr. Hutchings denied that the gas-works did not pay. If they were under a company, they would be able to give the shareholders a 10 per cent. dividend. An amendment was moved by Mr. Jarvis that the consideration of the matter be adjourned for a month; and this was seconded by Mr. Slocombe. The Chairman said he had noticed lately that gas was being given up by shopkeepers, and oil used instead. As a result of the reduction in price, it was believed that the consumption would increase; and the Board ought to be prepared for this. He believed there was a certain amount of danger from the way in which the works were at present carried on, and that they were not producing what they ought, in consequence of capital not being spent upon them. On being put to the vote, the amendment was carried; but on being put as a substantive motion, it was negatived in favour of a further amendment deferring the consideration of the matter for a fortnight only.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 5.

Sulphate of Ammonia.—Business during the week has been slow; still prices have given way very little, and the quantities on the market remain small. Leith seems to be the weakest market at the moment, and it is reported that business has been done at £10 12s. 6d.; while at Hull and Liverpool, £10 15s. could still be obtained. The considerably firmer tone in nitrate seems to indicate that sulphate values will be maintained also. It is highly probable that, at the first symptom of an upward turn in the market, orders will come in plentifully, as consumers seem to be waiting for lower prices; and they will hasten to complete their requirements when they find the market turning the opposite way. In spot nitrate, a large business has been done at 8s. 10½d.; and the local market appears to be cleared at the present moment.

LONDON, *Sept.* 5.

Tar Products.—Business is unquestionably dull in this market. The spurt in benzol seems to have subsided; and at the moment there appear to be no buyers, either for spot or forward delivery. Solvent naphtha is quotable a shade higher, with a trifle more inquiry. Very little is being done in oils, or in anthracene; while there is a move in carbolic acid, but so far it has not affected the price. No new business of any moment is reported in pitch; but makers are heavily sold, and therefore indifferent to the small fluctuations occurring in it. To-day's prices may be taken as follows: Tar, 24s. to 26s. Pitch, 32s. 6d. to 34s. Benzol, 90 per cent., 4s. 2d.; 50 per cent., 2s. 11d. Toluol, 1s. 6d. Solvent naphtha, 1s. 4d. Crude naphtha, 1s. 2d. Creosote, 1¼d. Carbolic crystals, 5d.; crude 60's, 1s. 2d. Cresol, 8d. Anthracene, "A" quality, 1s. 3d.; "B" quality, 11d.

Sulphate of Ammonia.—There has been no large business reported in this market during the past week. Small parcels have been sold for Continental account at prices ranging about £10 15s., less 3¼ per cent. Stocks are low; and makers are easy and hopeful that, with the advance of the season, prices will mend. Gas liquor is marked 4s. to 5s. 6d.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

As I have intimated in previous reports, the better qualities of round coal have, with the present month, commenced to harden up in price. It is only in a few exceptional cases where there has been any actually announced advance upon late quotations, and this has not gone beyond bringing prices back to last winter's rates; but it may be taken as an indication of the general tendency of the market. During the past month the demand for house fire consumption has been considerably above the average; and in many cases the output of the collieries has not been more than sufficient to keep up with the orders coming to hand. As a necessary consequence, the quantity of coal going down into stock continues exceptionally small; and as the winter months approach, the possibility of some scarcity in the supply becomes more evident. There are very few collieries where anything like the usual winter stocks have so far been secured; and should there be the demand which was experienced last winter, a great deal of difficulty will undoubtedly be felt in meeting requirements. At the pit mouth 12s. 6d. per ton is now becoming more nearly the average quotation for best Wigan Arley coals; and although 12s. is still quoted in some instances, colliery proprietors are indifferent about selling at this figure. Second qualities of Arley are firm at 10s. 6d. to 11s.; and Pemberton 4-feet coals at 10s. to 10s. 6d. per ton. With regard to the lower qualities of round coal suitable for iron melting, steam, and manufacturing purposes, there is no material change to report. The demand for these, either for inland requirements or for shipment, remains only moderate, and supplies generally are ample. Prices, however, are being steadily maintained at late rates; and it is only on occasional sales that some slight concession is made to meet competition from outside districts. At the pit mouth, steam and forge coals average 7s. 6d. to 8s., with some of the better qualities quoted at 8s. 3d., while, for delivery at the Garston Docks or the High Level, Liverpool, steam coal for shipment can still be bought readily at 9s. to 9s. 6d. per ton. Engine classes of fuel continue without any improvement. Common sorts, if anything, have been rather more of a drug during the last two or three weeks, owing to holiday stoppages of works and mills in the surrounding districts; while supplies from Yorkshire, Derbyshire, and Staffordshire have been coming in more freely. On both burgy and slack, prices have shown a weakening tendency; and one or two of the Manchester firms this month have made reductions on their list rates. At the pit mouth burgy does not average more than 6s. 6d. to 7s.; best qualities of slack, 5s. 6d. to 6s.; with common sorts obtainable at as low as 3s. up to 4s. per ton.

Northern Coal Trade.—The coal trade is still very brisk; and the demand for best steam coal has been quickened. Best Northumberland qualities are rather dearer on the week; the price having been raised to about 12s. 9d. per ton, free on board—several of the collieries having rather long turns. Second-class coals are unaltered; but for small steam, the demand is rather weak—the price ranging from 4s. to 4s. 6d., according to quality. Best Durham gas coals are still in strong demand, though the price is lower than it was last year at this time, when the Continental labour troubles artificially stimulated the prices. At present about 9s. 6d. to 9s. 9d. per ton free on board is the current price, though contracts are, of course, taken at less. The best gas coal collieries have now very full work, with large contracts ahead. In bunker coal, there is a better demand—higher freights having tempted some shipowners to send vessels to sea that had been idle; and thus the demand for bunker coal is increased. Manufacturing fuel is quiet; but there is a better demand for best blast-furnace coke. Gas coke is as yet unaltered in price. The production, however, is being increased as the nights lengthen.

Proposed Improvements at the Maryport Gas-Works.—The Gas Committee of the Maryport Trustees have decided to recommend the Board to apply for a Provisional Order for power to expend £4000 upon the renewal of the present gas plant.

The Abandonment of Electric Lighting at Barnet.—"A notable epoch in the history of Barnet closed on Monday," says the *Barnet Press* of last Saturday, "when the town was lighted for the last time by electricity under the auspices of Messrs. Joel and Co. The rival illuminants—gas and electricity—have had warm partisans; but we hope that the unsatisfactory results of the steady trial for three years of the new lighting system will reconcile its supporters to what may appear to some a policy of retrogression. . . . On Tuesday, the streets of Barnet were once more lit up with gas."

Serious Gas Explosion at Goole.—Last Wednesday afternoon, the United Methodist Free Church at Goole was partially wrecked by an explosion of gas. It appears that an elderly man named John Ashley, in the employment of the Gas and Water Company, was engaged in attending to the gas-meter, which was underneath a flight of stone steps; and he had a lighted candle to enable him to do the work, when the explosion took place. The lobby was shattered to pieces, and the chapel floor on one side was completely blown up; while a number of houses in the vicinity had the windows broken. Ashley was extricated with difficulty; and it was found that his right leg was badly shattered, and his head burnt.

The Gas Question in the Salford Out-Districts.—Last Friday, a special meeting of the Barton, Eccles, Winton, and Monton Local Board was held at Eccles, to consider the recommendations of the Joint Gas Committee appointed by Swinton and Eccles. After a sitting extending over three hours, the Board decided to promote a Bill to supply not only their own district with gas, but also the out-districts of Irlam, Cadishead, Worsley, Boothstown, Walkden, and Little Hulton, leaving the Swinton Local Board to supply their district and also the township of Clifton. The Swinton Local Board had previously confirmed this recommendation. Both Boards have appointed Committees to make the preliminary arrangements for the promotion of a joint Bill for the manufacture of gas. The number of gas consumers in the above districts is above 8000, and the yearly gas receipts about £25,000.

Electric Lighting for Manchester.—The Gas Committee of the Manchester Town Council submitted to that body last Wednesday a recommendation to the effect that the sum of £150,000 be raised by exercising the borrowing powers conferred by the Corporation Electric Lighting Order. Mr. Brooks moved that the minutes containing this recommendation be approved; and Alderman Sir John Harwood seconded it—observing that the Committee had for some time past been considering the best mode of putting down an installation of electricity. They consulted a number of well-known electrical engineers, and had a final conference with Dr John Hopkinson; and the whole of the matter, from beginning to end, had since been placed in his hands. He therefore anticipated that, in the course of twelve or fifteen months, Manchester would have the most modern and approved system of supplying electricity. The minutes were approved.

Australian Gaslight Company.—In their report on the operations of this Company during the six months ending June 30 last, the Directors state that the net profits, with the balance from the last account, amount to £52,159. Out of this they recommend dividends for the above period of 9s. per share on the fully-paid shares, and 6s. per share on those paid up to the extent of £4; absorbing £49,632, and leaving a sum of £2527 to be carried forward. The Engineer (Mr. T. J. Bush) reports the plant to be in excellent condition. On the 1st of July the Company made a substantial reduction in the price charged for the public lights to all the Municipalities in the suburbs of Sydney. Early in May last the capital of the Company was increased to £2,000,000; and a resolution was passed sanctioning an application to Parliament for power to supply the electric light. A Bill for this purpose will accordingly be introduced in the forthcoming session.

The Water Question at Gloucester.—The Gloucester City Council had the subject of the additional water supply for the city again under consideration at their last meeting. Mr. Turner proposed a resolution to the effect that the Finance, Estates, and Water-Works Committee be requested to prepare a report as to the practicability and probable expense of making reservoirs and filter-beds at Wainlode's Hill, or other suitable place, for the purpose of procuring a separate water supply for the city from the River Severn for general purposes; and that the report include the probable expense of obtaining water from the same source and distributing it over the city in a separate service for all manufacturing purposes, flushing sewers, drains, &c., reserving the Witcomb supply for drinking. There was a good deal of opposition to the proposal, on the ground that the river water was not fit for distribution; but the resolution was eventually carried.

The Salford Corporation Gas Committee and Inclined Retorts.—The Salford Gas Committee have received the report of a Special Sub-Committee, which was appointed in February last to visit various works at which inclined gas-retorts were in use. The report is of an elaborate character; the Sub-Committee having visited in the course of their inquiries the Birmingham Gas-Works, the Greenwich works of the South Metropolitan Gas Company, the Beckton works of The Gaslight and Coke Company, the Kensal Green station of the same Company, the Southall works of the Brentford Gas Company, and Hardman's Chemical Works at Tunstall. In concluding their report, the Sub-Committee state that there is every prospect of a revolution in the present method of setting retorts. Their investigations conclusively prove in their opinion: (1) That there will be a large saving in labour, estimated at 50 to 60 per cent.; (2) that the men employed will not be so long exposed to excessive heat, as under the present system; (3) that the uniform and rapid laying of charges will not depend on the skill of the stoker charging; (4) that the drawing is, to a large extent, self-acting and rapid; (5) that in case of emergency ordinary labourers can be employed, without detriment to the plant or falling off in the production of gas; (6) that there is no reason to believe that the retorts will not last, at least, as long as those in horizontal settings. It is believed that this report will have important results upon the management of the Salford Gas-Works.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 438.)

Issue.	Share	When ex-Dividend.	Dividend for 6 Months.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	—½	6 0 0
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	28 May	8	Bahia, Limited	20	13—15	..	10 13 4
200,000	5	13 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	218–223*	+3	5 9 10
125,000	,,	,,	9½	Do. New	100	157–162*	+1½	5 14 2
220,000	20	12 Mar.	11½	Brighton & Hove Original	20	41—43	+1	5 6 11
320,000	20	10 Apl.	11½	British.	20	44—46	..	4 17 10
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20*	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13—15*	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	90—95	..	6 6 4
150,000	20	13 Aug.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	10 Apl.	13¾	Commercial, Old Stock	100	255—265	..	5 3 9
130,000	,,	,,	10¾	Do. New do.	100	190—200	..	5 7 6
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	230—235	+2½	4 5 1
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190—200	..	3 10 0
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	200—205	..	4 17 7
486,090	10	15 July	10	European, Limited	10	20—21	..	4 15 3
354,060	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 16 9
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	230—235	..	5 10 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	254—259	..	3 17 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118—123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172—177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	159—164	..	4 5 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	153—158	..	3 16 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	231—236	..	5 1 9
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¼—4¾	..	6 6 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	111—113	..	4 8 6
541,920	20	11 June	6¾	Monte Video, Limited.	20	16—17	..	7 12 11
150,000	5	28 May.	10	Oriental, Limited	5	8¾—8¾	..	5 14 3
60,000	5	25 Mar.	7	Ottoman, Limited	5	4¾—5¼	..	6 7 3
166,870	10	26 Feb.	2	Pará Limited.	10	2¾—3¼	..	—
420,000	100	4 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	92—97	..	6 3 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	28 Apl.	10	San Paulo, Limited	10	13—15	..	6 13 4
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	278–283*	..	5 9 6
1,350,000	,,	,,	12	Do. B do.	100	230–235*	..	5 2 1
200,000	,,	,,	13	Do. C do.	100	240–245*	..	5 6 1
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	261—266	..	3 15 2
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	209—214	+1	3 14 9
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138—143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	107—112	..	3 11 5
708,000	Stck.	13 Aug.	10½	Kent	100	265—275	..	3 16 4
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	235—240	..	3 19 2
406,200	100	,,	7½	Do. 7½ p. c. max.	100	193—198	..	3 15 9
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—123	..	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares	100	341—346	..	3 10 1
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123—126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	164—169	..	3 16 11
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160—165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex.	100	252—257 *Exdiv.	..	3 17 10

Price: Morocco, Gilt, 18s.; Cloth, 15s.; Delivered Free.

THE FIFTH EDITION OF THE

HANDBOOK

FOR

Gas Engineers and Managers,

By THOMAS NEWBIGGING, M. Inst. C.E.

Price 3s. 6d. post free (76 Pages, Demy 8vo., Limp Cloth),

THE

VALUATION OF GAS-WORKS FOR ASSESSMENT,

By THOMAS NEWBIGGING, M. Inst. C.E.,

With an Appendix containing a Statement of the most Important Cases bearing on the Question, and decided by the Superior Courts. Each of these is preceded by a Digest; and the Judgments are given in full.

Now Ready, Price 6s., Bound in Cloth.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

WALTER KING, 11, Bolt Court, Fleet Street, E.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

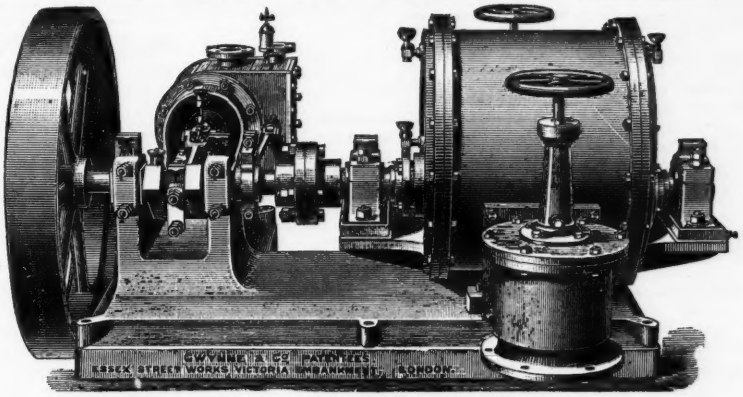
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE, 173, Fentiman Road, LONDON, S.W.

ADVERTISER (age 22) desires a position as CLERK or CLERK and COLLECTOR in a Gas Company's Office. Has had 2½ years' experience in present situation.
Address No. 1997, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

METER Inspector (age 22) seeks engagement. Competent man, understands testing, &c.; first-class references and character.
Address No. 1998, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady and trustworthy STOKER, used to Engine and Exhauster and Shovel Charging. Permanent employment. Wages in winter, 35s.; Summer months, 27s.
Apply, stating age and experience, with copies of testimonials, to Mr. A. REEVES Gas-Works Hythe, KENT.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 462 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 418.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

MR. ALFRED KITT, Consulting Engineer, 5, VICTORIA STREET, WESTMINSTER, late Engineer of the Pimlico and Westminster Stations of The Gaslight and Coke Company.

WATER-WORKS.

WANTED, a young married Man as TURNCOCK, also capable of doing a little Fitting, Repairs to Water-Meters, &c. Must be a total abstainer, character indispensable. Wages, 25s. per week, with House Rent free.
Address No. 1996, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANCHESTER CORPORATION GAS-WORKS.

MANAGER.

THE Gas Committee are prepared to receive APPLICATIONS for the appointment of a MANAGER for their Rochdale Road Gas Station.
The successful candidate will be required to devote the whole of his time to the duties of his office.
Applications, stating age and experience and salary required, and enclosing copies of recent testimonials, to be forwarded to the Office of the Superintendent of the Gas Department, on or before the 18th of September next, addressed to the Chairman of the Gas Committee, and endorsed "Application for Appointment of Station Manager."
Canvassing will disqualify.
By order,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
Aug. 28, 1891.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NEILSON AND SONS, GLASGOW. Telegraphic Address: "Gas Glasgow." Depôts throughout England and Scotland.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

WANTED, a young Man as Fitter and METER INSPECTOR.
Apply to the MANAGER, Gas-Works, Poole, DORSET.

WANTED, at once, a steady Man as STOKER. Must be well accustomed to Shovel Charging, to attending Steam-Engine and Exhauster, and the ordinary duties of a small Gas-Works. Wages 24s. 6d. per week.
Apply, with reference, to J. C. BENNETT, Manager Gas-Works, BRIDGNORTH.

HADDENHAM (CAMBRIDGESHIRE) GAS-WORKS.

THE Directors of the above are prepared to LET the whole of their WORKS, including House, Town Lights, &c., in hand at Michaelmas next, at an annual Rental of £30. Population about 1800. Can be had yearly, or for a term of years.
For further particulars, apply to JOHN FEAST, Haddenham, CAMBS.

DALTON-IN-FURNESS.

THE Committee of Management of the Dalton Gas-Works invite TENDERS for an EXHAUSTER, to pass 5000 cubic feet per hour; also for one to pass 3000 cubic feet per hour. Also a 1-horse power GAS-ENGINE, with PUMP, &c.
Further particulars may be obtained on application to Mr. Jones, the Gas Manager.
Tenders, sealed and endorsed "Exhauster," and addressed to the undersigned, will be received up till Thursday, the 17th of September.
The lowest or any tender not necessarily accepted.
FRANCIS H. CLARK,
Secretary.

OFFERS Wanted for Numbers of the JOURNAL OF GAS LIGHTING from 1850 to 1888, almost complete, some bound; also for bound "Reports of Proceedings of the British Association of Gas Managers," eleven years.

Full particulars on application to Mr. GEORGE GOLDSMITH, 19, Oxford Street, LEICESTER.

FOR SALE—The following Second-hand GAS APPARATUS:—

Evan's "Reliable" Steam-Pump, for pumping Tar and other Liquids. Practically equal to new. Steam Cylinder, 8 inches; Pump Cylinder, 6 inches. In thorough good order, only lately put down.

Double Cylinder Vertical Pumping-Engine, by Daniels, on cast-iron Bed-Plate. Crank-Shaft, 2¼ inches diameter. Complete, with fast and loose Pulleys.

Warner and Cowan's Patent Self-Regulating Drum Gas-Meter for 250 lights (one revolution of Drum to 12·5 cubic feet), 1500 cubic feet per hour, 4 ft. 6 in. diameter by 3 ft. deep, with Feed and Supply Connections.

Esson's Patent Compensating Gas-Meter No. 8. 2 ft. 9 in. diameter by 1ft. 9 in. deep, with Feed and Supply Connections.

Address CHARLES D. PHILLIPS, M.I.M.E., Newport, MON.

KETTON GAS AND COKE COMPANY, LIMITED.

TO BE SOLD by Tender, the Ketton Gas- WORKS and PLANT, comprising Manager's House, Retort and Purifying Houses, Purifier, Scrubber, Condenser, Meters, Mains, and other effects. The purifying apparatuses are first class, and have recently been erected at great cost.

The above will be sold as a going concern, and is well worth the attention of working Gas Managers and Capitalists.

Ketton, Rutland, is a large and important Village, with a population of 1084. The Works are about 100 yards from the Railway Station.

Sealed tenders to be sent to the Secretary, 33, St. Leonard's Street, Stamford, on or before the 15th inst.

Apply to the Manager at the Works to view, and to the Secretary for further particulars.

H. B. BARNETT,
Secretary.

Stamford, Sept. 3, 1891.

LOCAL BOARD FOR THE DISTRICT OF SWINDON NEW TOWN.

GAS-FITTINGS FOR PUBLIC OFFICES.

THIS Board is desirous of receiving TENDERS for the supply of GAS-FITTINGS, various BRACKETS, PENDANTS, CHANDELIERS, and SUNLIGHTS, specification of which can be obtained on application, by letter, to the Surveyor, No. 10, Queen Anne's Buildings, New Swindon, Wilts.

Tenders, endorsed "Gas-Fittings for Public Offices," must be left at my Office, No. 10, Queen Anne's Buildings, Farringdon Street, New Swindon, by Twelve o'clock noon on Friday, the 18th day of September next.

No pledge is given to accept the lowest or any tender.

HENRY KINNEIR,
Clerk to the Local Board.

New Swindon,
Aug. 24, 1891.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.

THE above Company invite Tenders for the Surplus TAR, also for the whole of the AMMONIACAL LIQUOR, produced at their Works, at per ton, over the Company's Machine, from the 1st of July, 1891, to the 30th of June, 1892, both inclusive.

Probable quantity of Tar, 600 tons.
" " Liquor, 800 tons.

Both the Tar and the Ammoniacal Liquor to be taken from the Company's elevated Tank into the Contractor's Carts or Casks, which must be supplied as required by the Vendors.

Tenders for the Ammoniacal Liquor must state price per degree Twaddel's Hydrometer, from 4° to 8°.

Further particulars may be obtained of the Manager at the Gas-Works, St. Mark's Street.

Tenders to be sent to the undersigned on or before the 14th of September, 1891, endorsed "Tender for Tar or Liquor."

The Company do not bind themselves to accept the highest or any tender.

DAVID WOOD,
Secretary.

Offices: St. Mark's Street, Hull,
Sept. 5, 1891.

TO GASHOLDER MAKERS.

THE Directors of the Ashton Gas Com- pany invite TENDERS for the construction and erection of a TELESCOPIC GASHOLDER, 140 feet diameter and 130 feet deep, with the necessary Columns and Girders complete.

Drawings may be seen, and copies of specification obtained, on application to the undersigned, to whom sealed tenders, endorsed "Tender for Gasholder," must be delivered on or before Saturday, the 19th of September, 1891.

DAVID CLARKE,
Engineer and Manager.

Gas Offices, Ashton-under-Lyne,
Aug. 29, 1891.

TO COAL MERCHANTS.

THE Improvement Commissioners for the District of Milton-next-Sittingbourne invite TENDERS for the supply and delivery, during the year ending Sept. 1, 1892, of 800 tons of GAS COALS.

The Coals must be delivered, free of all costs, alongside the Town Wharf in Milton Creek, at such times and in such quantities as the Manager of the Gas-Works shall direct.

Forms of tender will be furnished by the Manager on application; and no tender will be accepted unless on such form.

Sealed tenders, endorsed "Tender for Coals," and addressed to the Chairman of the Milton Improvement Commissioners, must be sent to, or delivered at, my Office in Milton, on or before Sept. 19 inst.

The Commissioners do not bind themselves to accept the lowest or any tender.

WM. PARHAM, Clerk.

Milton-next-Sittingbourne,
Sept. 2, 1891.

HEBBURN MAIN GAS COALS.

Produce of Gas per ton	10,500 feet.
" Coke "	13½ cwt.
Illuminating Power	16 candles.

For Prices, f. o. b. Ship or delivered, apply to

W. RICHARDSON,

Hebburn Colliery Offices, NEWCASTLE-on-TYNE.

Demy 8vo., price 6d., post free.

THE STANDARD OF LIGHT.

By WALTER GRAFTON,

Of The Gaslight and Coke Company, Beckton.

A reprint of the articles, with accompanying tables in Vol. LVII. of "The Journal of Gas Lighting."

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Price: 10*s. per* 100; £1 2*s. 6d. for* 250; £2 *for* 500; £3 15*s. per* 1000. *Specimen copy (by post),* 4*d.*

The Use and Value of

Sulphate of Ammonia as Manure.

BY

WILLIAM ARNOLD, F.S.I.,

Land and Estate Agent; Rating Surveyor and Valuer; Chairman of the Tamworth Gaslight and Coke Company.

Together with Valuable Formulæ, Rotation of Crops, and Manures for the same, intended for the use of Tenant Farmers and others interested in Land, and to promote the Sale of Sulphate of Ammonia, for the production of Home-Grown Corn and other Crops, by English Gas Companies.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

CASES FOR BINDING VOLUMES OF THE "JOURNAL"

(GREEN CLOTH, GILT LETTERED)

May be had of the Publisher,

Price 2s. each.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

JAMES NEWTON & SONS,

(Established 1820)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY and every Article suitable for

GAS AND WATER WORKS.

FIRE-BRICKS. ✣ ✣ FIRE-CLAY.

JAMES WHITE & Co., Limited,

Albert Oil-Works,

WIDNES, LANCASHIRE,

Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.

ANALYSIS AND REFERENCES ON APPLICATION.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

Head Office: CORPORATION STREET, BIRMINGHAM.

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THOMAS LIGHTING Co.,
LTD.,
15, CARTHUSIAN ST.,
LONDON, E.C.

Manufacturers of the "Thomas" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

J. C. CHAPMAN,
Assoc.M.Inst.C.E., M.Inst.M.E., Fel. Inst. Patent Agents,
70 CHANCERY LANE, LONDON, W.C.

Special experience in Gas and Ammonia Plant.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

THOMAS TURTON AND SONS, LIMITED,

Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
90, CANNON STREET, E.C.
PARIS DEPOT: 3, BOULEVARD DE BELLEVILLE

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY
OF THE PRINCIPAL
ENGLISH & SCOTCH
CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON
APPLICATION.
T. B. KITTEL, SHEFFIELD.

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

Used by the largest Gas Companies in London, and entirely superseding the use of Cannel Coal.

For Price and Full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
FRANK W. CLARK, Engineer,
48, SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,
153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

CLAYTON, SON, & Co.

LIMITED,
LEEDS,

60, QUEEN VICTORIA STREET, E.C. LONDON OFFICE.

MAKE

RETORT LIDS

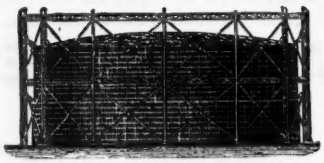
OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
MACHINERY.

PRICES ON APPLICATION.

W. C. HOLMES & CO., WHITESTONE IRON-WORKS, HUDDERSFIELD,

Makers of the

PATENT SCRUBBER-WASHER,
PATENT EXHAUSTERS,
PATENT ANTI-DIP PIPES,
BROOK'S GAS PRODUCER.



GASHOLDERS, ALL SIZES,
PURIFIERS, SCRUBBERS,
CONDENSERS, AND VALVES
OF EVERY KIND.

London Office: 80, CANNON STREET, E.C. **Illustrated Catalogues on Application.**

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.

Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND
EVERY REQUISITE
FOR
GAS-WORKS.

MOBBERLEY & PERRY,

Fire-Brick Works, STOURBRIDGE.

☛ Retort Setters sent to any part of the Kingdom.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

REGENERATIVE SETTINGS OF RETORTS.

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

JOHN BROTHERTON, LIMITED,

IMPERIAL TUBE WORKS,

WOLVERHAMPTON,

Paris Exhibition 1867.
Amsterdam Exhibition 1883.
Silver Medal and First-Class Certificate
Bronze Medal and Special Diploma
Adelaide Exhibition 1887.
First Order of Merit and Medal.

MANUFACTURERS OF
WELDED IRON TUBES AND FITTINGS
FOR GAS, STEAM, WATER, &c.
LAP-WELDED TUBES
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS, AND OTHER PURPOSES.
HYDRAULIC AND HOT-WATER TUBES.
COILS OF ALL SIZES AND SHAPES.
Stocks, Taps, Dies, Taper Telegraph Poles, &c., &c.

Paris Exhibition 1867.
Calcutta Exhibition 1883 *and* 1884.
Silver Medal and First-Class Certificate.

London Offices: 3, Jeffrey Square, St. Mary Axe, E.C.
Telegraphic Address: "BROTHERTON, WOLVERHAMPTON."

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

Lanemark Coal Co.,
LIMITED.

LANEMARK CANNEL
AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

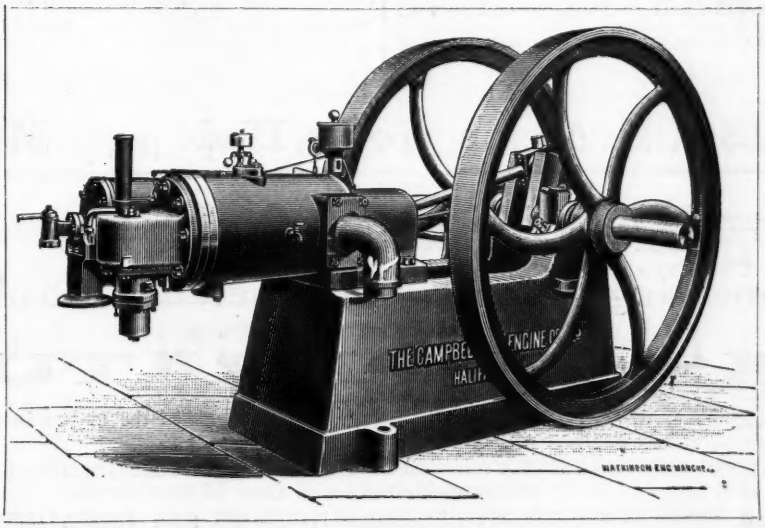
EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or F. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

THE "CAMPBELL" GAS-ENGINE,

MOST SIMPLE AND MOST EASILY MANAGED.



MOST ECONOMICAL IN GAS AND LEAST LIABLE TO BREAKDOWNS.

Our Engines are used by Her Majesty's War Department; The South Metropolitan Gas Company, London, S.E.; at the Sydenham Gas-Works; Tiverton Gas-Works; Filey Gas-Works, &c.

Prices and full particulars from the sole makers—

THE CAMPBELL GAS-ENGINE CO., LTD., HALIFAX, ENGLAND.
LONDON: 114, TOOLEY STREET, LONDON BRIDGE. GLASGOW: 111, WEST GEORGE STREET.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
.C X C	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.
WIDNES.
HALIFAX.
ALTRINCHAM.
DENTON.
ST. ALBANS.
DUKINFIELD.
NORTHWICH.
HUDDERSFIELD.
BURY.
BRIGHOUSE.
MARKET HARBRO'.
PRESCOT.
SOWERBY BRIDGE.
LEICESTER.
DARWEN.
NELSON.
ORMSKIRK.
CHORLEY.
WHITEHAVEN.
CHESTER.
SOUTH SHIELDS.
LEEK.
IPSWICH.
BOURNEMOUTH.
SALFORD.
LUTON.
HAMPTON COURT.

FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

PATENT RIVET COMPANY, LTD., SMETHWICK, NEAR BIRMINGHAM.

Established 1843.

TELEGRAMS: "PRIVET, BIRMINGHAM."

MANUFACTURERS OF

BOLTS & NUTS
FOR
PIPE JOINTS,
FLANGE JOINTS,
RETORT MOUTH-PIECES,
SCRUBBERS,
CONDENSERS,
PURIFIERS,
SIEVES, TANKS,
ENGINES,
BOILERS,
&c., &c.

RIVETS
FOR
GASHOLDERS,
BOILERS,
GIRDERS,
TANKS,
COVERS,
&c., &c.; ALSO
SET SCREWS,
WASHERS,
SPIKES,
AND
FISH PLATE BOLTS.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

Abercorn Foundry and Abbey Works,

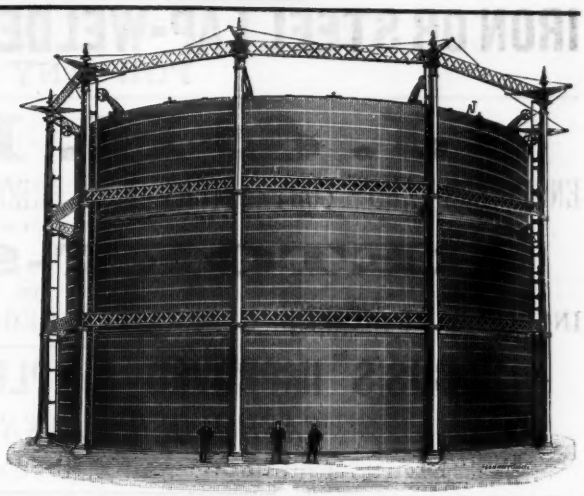
PAISLEY, N.B.,

MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.

Telegraphic Address: "Donald Paisley."



AUTOMATIC COAL-GAS RETORTS.

GOLD MEDAL, PARIS EXHIBITION, 1889.

THE CHIEF ADVANTAGES CLAIMED FOR THIS PROCESS MAY BE SUMMARIZED AS FOLLOWS:—

1. **No skilled labour required.**
2. **Wear and tear of carbonizing tools reduced 50 per cent.**
3. **Great reduction in erection of Ascension-Pipes and Hydraulic Mains.**
4. **Coal carbonized one-sixth quicker than by the old process.**
5. **Absolute control of production by unskilled labour.** (This is most important, especially when there is an extra demand for Gas, as in the case of foggy days, &c.)
6. **Fifty per cent. saving in space of permanent Buildings, thus enabling an old Retort-House fitted by this System to manufacture twice the quantity of Gas.**
7. **This System enables the whole of the old Retorts, Doors, Fittings, &c., to be used (if required) where the Morris and Van Vestraut's latest improvements are adopted.** (These improvements were described by Mr. Van Vestraut in his Paper read at the meeting of The Gas Institute in 1890. See JOURNAL for July 8, 1890.)
8. **The Morris and Van Vestraut's System effects a reduction in the cost of carbonizing from 40d. to 10d. (average London prices) per ton of coal, or a saving of more than 70 per cent. in cost of labour.**

This System of Automatically Charging and Discharging Retorts, without machinery or arduous labour, is being largely adopted at the Works of The Gaslight and Coke Co., the South Metropolitan Gas Co., and the Brentford Gas Co., and of several of the Provincial Gas Companies and Corporations.

This Process is fully Patented, and any Infringer will be strictly proceeded against.

For further particulars apply to W. M. KIGHT, Secretary, AUTOMATIC COAL-GAS RETORT COMPANY, LTD.
86 and 88A, LEADENHALL STREET, LONDON, E.C. [See Illustrated Advt., p. 418.

D. HULETT & CO., LTD.,

GAS ENGINEERS,

55 and 56, HIGH HOLBORN, LONDON,

Manufacturers of every description of Gas-Fittings.

HULETT'S PATENT STREET-LAMPS.

No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
The glass can be removed for repainting.
Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of best material.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

J. & H. ROBUS,

ENGINEERS AND CONTRACTORS FOR ERECTING GAS AND WATER WORKS COMPLETE.

SPECIALITIES:

RETORT-SETTINGS

ON THE

INCLINED PRINCIPLE, GENERATIVE, REGENERATIVE, & RECUPERATIVE SYSTEMS.

ROBUS'S IMPROVED SIMPLE FIRING RETORT-SETTINGS.

GASHOLDER TANKS AND MAIN LAYING.

Plans, Estimates, and Particulars submitted on application

CITY OFFICES:

MANSION HOUSE CHAMBERS, 20, BUCKLERSBURY, LONDON, E.C.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF

GAS HOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES,

PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

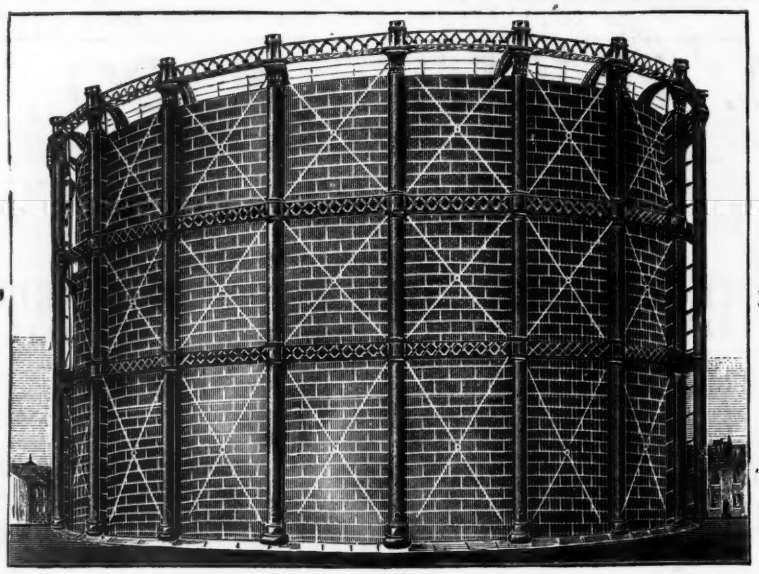
STRUCTURAL IRON

AND STEEL WORK.

BRIDGES,

ROOFS,

PIERS, ETC.



WORKS & HEAD OFFICE

TIPTON,

STAFFORDSHIRE.

LONDON OFFICE:

11, VICTORIA ST.,

WESTMINSTER.

TELEGRAPHIC ADDRESSES:

"HORSELEY, TIPTON."

"GALILEO, LONDON."

HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

And all Classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

LONDON: 13, BILLITER STREET, E.C.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

JONAS DRAKE & SON.

—GAS— —ENGINEERS— —CONTRACTORS— —IRONFOUNDERS— —RETORT SETTERS— —ETC.—

Specialities in CARBONIZING PLANT.

GENERATOR AND REGENERATOR FURNACES.

OVENDEN,

HALIFAX (YORKS.)

CROSBIE'S

Economical and Durable.

Paints

Specialty—Red Oxides.

For Gas-Works Use,

AND ALL OUTDOOR IRON AND WOOD WORK.

These Paints are used at a large number of Gas-Works throughout the Kingdom.

ADOLPHE CROSBIE,

Colour Works, WOLVERHAMPTON.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS,

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

Gas-Bags for Mains. High-Water Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber, and Stokers' Gloves.

Write for Price List to

THOMAS BUGDEN, Manufacturer,

116 & 118, GOSWELL ROAD, LONDON, E.C.

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint, Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERNS COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.

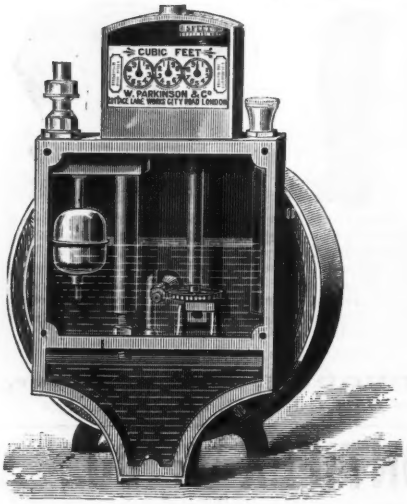
Weight of illuminating power in pounds of sperm, 320·80. Very free from impurities.

Telegrams: "ATLAS SHEFFIELD."

W. PARKINSON & Co.

ESTABLISHED 1816

THE ORIGINAL MANUFACTURERS OF WET METERS.



ORDINARY WET METERS

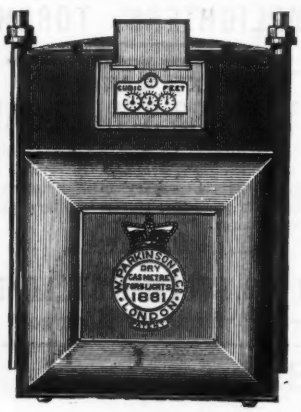
IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.

COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.



DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected, and the brasswork and smaller fittings are of superior workmanship.

COTTAGE LANE WORKS, CITY ROAD.
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS.
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE.
MANCHESTER.
Telegraphic Address: "PRECISION."

[See also Advt., p. 434.

London Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Sept. 8, 1891.